DECLARATION OF GEORGIOS ZERVAS ISO GOOGLE, LLC'S OPPOSITION TO PLAINTIFF'S MOTION FOR CLASS CERTIFICATION AND APPOINTMENT OF CLASS REPRESENTATIVES AND CLASS COUNSEL

Unredacted Version of Document Sought to be Sealed

QUINN EMANUEL URQUHART & SULLIVAN, LLP
Diane M. Doolittle (CA Bar No. 142046)
dianedoolittle@quinnemanuel.com
Sara Jenkins (CA Bar No. 230097)
sarajenkins@quinnemanuel.com
555 Twin Dolphin Drive, 5th Floor
Redwood Shores, CA 94065
Telephone: (650) 801-5000
Facsimile: (650) 801-5100

Andrew H. Schapiro (admitted *pro hac vice*)
andrewschapiro@quinnemanuel.com
Teuta Fani (admitted *pro hac vice*)
teutafani@quinnemanuel.com
191 N. Wacker Drive, Suite 2700
Chicago, IL 60606
Telephone: (312) 705-7400
Facsimile: (312) 705-7401

Stephen A. Broome (CA Bar No. 314605)
stephenbroome@quinnemanuel.com
Viola Trebicka (CA Bar No. 269526)
violatrebicka@quinnemanuel.com
Crystal Nix-Hines (Bar No. 326971)
crystalnixhines@quinnemanuel.com
Alyssa G. Olson (CA Bar No. 305705)
alyolson@quinnemanuel.com
865 S. Figueroa Street, 10th Floor
Los Angeles, CA 90017
Telephone: (213) 443-3000
Facsimile: (213) 443-3100

Josef Ansorge (admitted *pro hac vice*)
josefansorge@quinnemanuel.com
Xi ("Tracy") Gao (CA Bar No. 326266)
tracygao@quinnemanuel.com
Carl Spilly (admitted *pro hac vice)*
carlspilly@quinnemanuel.com
1300 I Street NW, Suite 900
Washington D.C., 20005
Telephone: (202) 538-8000
Facsimile: (202) 538-8100

Jomaire Crawford (admitted *pro hac vice*)
jomairecrawford@quinnemanuel.com
51 Madison Avenue, 22nd Floor
New York, NY 10010
Telephone: (212) 849-7000
Facsimile: (212) 849-7100

Jonathan Tse (CA Bar No. 305468)
jonathantse@quinnemanuel.com
50 California Street, 22nd Floor
San Francisco, CA 94111
Telephone: (415) 875-6600
Facsimile: (415) 875-6700

Attorneys for Defendant Google LLC

UNITED STATES DISTRICT COURT
NORTHERN DISTRICT OF CALIFORNIA, OAKLAND DIVISION

CHASOM BROWN, WILLIAM BYATT, JEREMY DAVIS, CHRISTOPHER CASTILLO, and MONIQUE TRUJILLO, individually and on behalf of all similarly situated,

Plaintiffs,

v.

GOOGLE LLC,

Defendant.

Case No. 4:20-cv-03664-YGR-SVK

DECLARATION OF GEORGIOS ZERVAS IN SUPPORT OF GOOGLE, LLC'S OPPOSITION TO PLAINTIFF'S MOTION FOR CLASS CERTIFICATION AND APPOINTMENT OF CLASS REPRESENTATIVES AND CLASS COUNSEL

Judge: Hon. Yvonne Gonzalez Rogers
Hearing Date: September 20, 2022
Hearing Time: 2:00 p.m..

I, Georgios Zervas, declare as follows:

1. Counsel for Defendant Google, LLC retained me to provide expert analysis and, if requested, expert testimony in this matter.

2. I submit this declaration in support of Google's Opposition to Plaintiff's Motion for Class Certification.

3. Attached as Exhibit 1 is a true and correct copy of the Expert Report of Georgios Zervas, dated April 15, 2022. The opinions I provided therein are true and correct to the best of my knowledge.

4. Attached as Exhibit 2 is a true and correct copy of the Expert Rebuttal Report of Georgios Zervas, dated June 7, 2022. The opinions I provided therein are true and correct to the best of my knowledge.

I declare under penalty of perjury of the laws of the United States that the foregoing is true and correct. Executed in THESSALONIKI, GREECE on July 29th, 2022

By ______________
Georgios Zervas

EXHIBIT 1

UNITED STATES DISTRICT COURT

NORTHERN DISTRICT OF CALIFORNIA, OAKLAND DIVISION

CHASOM BROWN, WILLIAM BYATT, JEREMY DAVIS, CHRISTOPHER CASTILLO, and MONIQUE TRUJILLO, individually and on behalf of all other similarly situated, Plaintiff, v. GOOGLE LLC, Defendants.	Case No. 5:20-cv-03664-YGR

EXPERT REPORT OF GEORGIOS ZERVAS, PHD

APRIL 15, 2022

TABLE OF CONTENTS

I. EXECUTIVE SUMMARY

1. I have been engaged in this matter by counsel for Google LLC ("Google") to explain certain aspects of the technology at issue, including features and operation of Private Browsing Modes[1] in Chrome and other browsers, and data transmissions that occur when a user visits websites in Regular or Private Browsing Mode. Based on my experience, the materials I reviewed in this matter, and my testing of Chrome and other browsers, I have reached the following opinions.

Opinion 1 (See Section IV)

2. Private Browsing Modes ensure that other people who use the same device won't see the user's activity after the Private Browsing Session is closed. Private Browsing Modes also ensure that cookie values generated during the Private Browsing Session cannot be used to provide a link to the user or her device after the session is closed.

3. Private Browsing Modes on the major browsers provide similar functionality, with some differences in implementation between browsers. For example, Google describes that Incognito Mode in Chrome will not save information like browser history and cookies after the Incognito session ends, so that other people who use the same device won't see the user's Incognito browsing activity. Other companies like Apple (Safari), Microsoft (Edge), and Mozilla (Firefox)

---

1 Throughout this report, I use the term "Private Browsing Mode" to refer generally to private browsing modes of various browsers, and I use the term "Private Browsing Session" to refer to browsing sessions where the browser is in Private Browsing Mode. I use the term "Incognito Mode" or simply "Incognito" to refer to the Private Browsing Mode of the Chrome browser in particular. I use the term "Regular Mode" to refer to browsing modes other than Private Browsing Mode. Regular Mode can encompass multiple modes of browser operation depending, for example, on a user's sign-in state.

describe the Private Browsing Modes of their browsers in a similar manner—in each case, the browser will not save browsing activity data after the Private Browsing Session ends.

4. The way browsers accomplish this is to start a Private Browsing Session with a "clean" browser—when the session starts, the user is not logged into her accounts and browsing history or cookies from prior sessions are not accessible within the Private Browsing Session. Then, when the user ends the Private Browsing Session, the browser discards any browsing history or cookies that were stored by the browser during the Private Browsing Session, so that data is not accessible in subsequent sessions. By starting with a "clean" browser when Private Browsing Mode is launched, and discarding data associated with the user's browsing activity when the session is closed, Private Browsing Modes ensure that other people who use the same device won't see the user's activity from the Private Browsing Session. This also ensures that the cookie values generated during the Private Browsing Session cannot be used to provide a link to the user or her device after that session is closed, unless the user explicitly enables a website to make this association by signing into the website during the Private Browsing Session, or enables Google to do so by signing into their Google account during the Private Browsing Session.

5. As demonstrated in this report, I have tested the Private Browsing Modes of the major browsers on several popular operating systems and have confirmed that the Private Browsing Modes work as described in public documentation. For example, I tested the Chrome browser by visiting websites in Regular and Incognito mode, and observed that in subsequent Regular Mode sessions only the websites that I visited in Regular Mode were shown in the browser history—the websites I visited in Incognito mode were not recorded in the browser history. My tests further confirmed that Private Browsing Modes (1) prevent browsing history from being saved on the device, (2) prevent the user and browser in Private Browsing Sessions from accessing

browsing history and cookies from Regular Mode sessions, and (3) discard cookies placed on the browser during the Private Browsing Session when that session is closed. I also performed tests confirming that users are not logged into any accounts (including Google accounts) upon initiation of a Private Browsing Session, and browser download records and "autofill" information from a Private Browsing Session are not available after that session is closed.

6. Because cookie values associated with Private Browsing Sessions are not shared with other browsing sessions, this information cannot be used to link the Private Browsing Mode activity to a user or her device after that Private Browsing Session is closed. Based on my experience, information I have reviewed, and testing I have performed, it is also my opinion that, to the extent Google receives cookie values when a user (who is not logged into a Google account) visits in Private Browsing Mode a third-party website containing Google analytics or advertising code, those cookie values would be distinct from any cookie values that Google may receive when the user is in Regular Mode. As a result, these cookie values cannot be used to link the Private Browsing Mode activities to a user or her device after that Private Browsing Session is closed, which would prevent Google from using the cookie values to create a "cradle-to-grave profile of users," as Plaintiffs allege.

7. Private Browsing Modes do not and are not designed to provide users complete anonymity or invisibility as they browse the web. Even in Private Browsing Mode, web browsing necessarily involves transmission of messages from a user's browser—otherwise the webpages would not render. The transmission of those messages must conform to protocols and standards, such as the HTTP protocol, and include information such as IP addresses.

Opinion 2 (See Section V)

8. Whether Google receives information when a user in a Private Browsing Mode visits a third-party website that uses Google services, and how that information can be used if received by Google, depends on multiple choices available to website developers and users. There are several settings available to websites that use products like Google Analytics or Google Ad Manager that will impact data transmissions to Google. User settings also impact data transmissions to Google that may occur when the user visits such a website.

9. Private Browsing Modes are not designed to block all communications between the browser and third-party web-services that the website owner has incorporated in their website. And those communications would necessarily conform to multiple industry standards and protocols, including HTTP messages with required fields and IP addresses required to deliver those HTTP messages. However, browsers (including Chrome) have numerous *other* settings and available features that prevent the transmission of certain categories of At-Issue Data. These settings include, but are not limited to, cookie settings, JavaScript extensions and settings, and various extensions and standalone applications that are designed to prevent certain data transmissions. I have tested these features in both Private Browsing Mode and Regular Mode. My tests confirm that they function as explained in public documentation and that they impact data transmissions to Google, whether or not the user is browsing in Private Browsing Mode. And even though my tests focus separately on each setting, users can use combinations of these settings and extensions to select the optimal balance of privacy and user experience.

II. INTRODUCTION

A. Qualifications

10. I am an Associate Professor of Marketing at Boston University Questrom School of Business, a founding member of the Faculty of Computing & Data Sciences, and Affiliated Faculty of the Department of Computer Science. I am also a visiting researcher at Microsoft Research New England. Prior to joining the Boston University faculty, I held academic roles including visiting scholar at the MIT Sloan School of Management, Simons Postdoctoral Fellow at Yale University, and affiliate at the Center for Research on Computation and Society at Harvard University's John A. Paulson School of Engineering and Applied Sciences. I am an associate editor of *ACM Transactions on Economics and Computation,* and I sit on the editorial review boards of *Marketing Science*, the *Journal of Marketing Research*, and the *Journal of Marketing.*

11. My research, which falls in the broader area of digitization, combines methods from computer science and economics to study online marketplaces to understand their impact on consumer and firm behavior. I have conducted studies on online marketplaces such as Airbnb, Yelp, TripAdvisor, and Expedia. My work is empirical in nature and relies on assembling and analyzing novel sources of data that I collect from these marketplaces to study their operation. I hold a Bachelor of Engineering and a Master of Science in Computer Science from Imperial College in London, a Master of Arts in Interactive Media from London College of Communication, and a Ph.D. in Computer Science from Boston University. Before pursuing my Ph.D. in computer science, I ran a small information technology (IT) company. My C.V. is attached as **Appendix A**, and a list of my prior testimony is attached as **Appendix B**.

12. I am being compensated at the rate of $700 per hour for my time on this case. Research and analysis for this report was also performed by Analysis Group personnel under my

direction and guidance. My compensation is not contingent upon my findings, the testimony I may give, or the outcome of this litigation.

B. Summary of Plaintiffs' Allegations

13. It is my understanding that the alleged Class Period in this case is June 1, 2016 through the present.[2] I further understand that Plaintiffs allege that Google improperly intercepted, received, or collected data from Chrome browser users and non-Chrome browser users who (i) have a Google account; (ii) accessed a non-Google website containing "Google tracking or advertising code;" while (iii) having private browsing mode enabled in a browser; and (iv) not logging into a Google account.[3]

14. I understand Plaintiffs allege that Google, by means of services like Google Analytics, "fingerprinting" techniques, "concurrent Google applications and processes on a consumer's device," and Google Ad Manager, collects the following categories of information that enable Google to identify users, their devices, and activity ("At-Issue Data"). Specifically, the At-Issue Data includes the following:

a. GET requests a browser sends to a website instructing what information to display in the browser.

b. IP address of the browser's connection to the internet.

c. Information identifying the browser software that the user is using, including any "fingerprinting" data.

d. Any "User-ID" issued by the website to the user.

---

2 Third Amended Class Action Complaint, *Chasom Brown, et al., v. Google LLC*, United States District Court Northern District of California, February 3, 2022 ("Complaint"), ¶ 2.

3 Complaint, ¶ 192.

e. Geolocation of the user.

f. Information contained in "Google cookies."[4,5]

15. I further understand Plaintiffs allege that Google builds "profiles" on individuals and their devices "[b]y tracking, collecting and intercepting users' (including Plaintiffs' and Class members') personal communications indiscriminately—regardless of whether users attempted to avoid such tracking pursuant to Google's instructions—Google has gained a complete, cradle-to-grave profile of users."[6]

16. I understand Plaintiffs further allege that:[7]

> a. In many cases, Google is able to associate the data collected from users in "private browsing mode" with specific and unique user profiles through Google Analytics User-ID. Google does this by making use of a combination of the unique identifier of the user it collects from Websites, and Google Cookies that it collects across the internet on the same user;
>
> b. Information collected from Google Cookies, which includes identifying information regarding the user from private browsing sessions and non-private browsing sessions, across multiple sessions;
>
> c. Identifying information regarding the consumer from various Google fingerprinting technologies that uniquely identify the device, such as X-Client-Data Header, GStatic, and Approved Pixels;
>
> d. Geolocation data that Google collects from concurrent Google processes and system information, such as from the Android Operating System; and
>
> e. The IP address information, which is transmitted to Google's servers during the private and non-private browsing sessions. Google correlates and aggregates all of this information to create profiles on the consumers.

---

4 Complaint, ¶¶ 8, 63, 69-70, 100, 105-108.

5 I also understand that Plaintiffs refer to the X-Client-Data header as a field they contend to be used to identify Incognito users. See Complaint, ¶ 96.

6 Complaint, ¶ 93.

7 Complaint, ¶ 93.

C. Assignment

17. I have been engaged by counsel for Google to explain the relevant technology at issue: Private Browsing Modes in Chrome and other browsers and Google's advertising or analytics services offered to third party websites. My opinions are described in this report. Specifically, I was asked to explain and analyze:

a. how internet communications and web browsing operate;

b. how Private Browsing Modes operate across different browsers and operating systems;

c. how Google's analytics and advertising products operate and which information they require to function;

d. what data is transmitted to Google when a user visits a website that uses Google analytics and advertising products in Private Browsing Mode, and how those transmissions are impacted by user and website owner settings.

D. Facts and Data Considered

18. In forming my opinions, I have relied upon my professional and academic experience and reviewed documents obtained from public sources. These materials include data produced from my experiments discussed in this report. I have also reviewed and relied upon the deposition testimony of Google witnesses and documents produced by Google in this case.

19. The sources I considered in forming my opinions are identified in this report and the accompanying exhibits and are listed in the attached **Appendix C**.

20. Should additional relevant documents or information be made available to me, I reserve the right to supplement my opinions as appropriate.

III. BACKGROUND

A. How Internet Communications Operate

21. The Internet can be understood as a network connecting computing devices (e.g., desktop computers, laptops, phones, TVs, tablets, and home appliances). These computing devices are connected by communication links such as cables and radio spectrum systems that transmit data between them. Because these communication links have constraints on how much data can be transferred per unit of time, transmitted data is split into packets and is then "reassembled" upon delivery.[8]

22. All data transmissions on the Internet rely on protocols that define the rules of how data are transmitted and interpreted. Widely used protocols include Transmission Control Protocol (TCP), User Datagram Protocol (UDP), Internet Protocol (IP), and Hypertext Transfer Protocol (HTTP).[9] These and many other protocols are a part of Internet standards that are set by the Internet Engineering Task Force (IETF).[10]

23. Web browsing operates as a network of clients (e.g., devices that users use to browse the Internet) that send requests for information to servers which respond to these requests by sending back requested data (e.g., data the device can use to display a web page) or modifying data on the server. Examples of servers include website and email servers.

---

[8] Zola, Andrew, Alexander S. Gillis, "network packet," *TechTarget*, available at https://www.techtarget.com/searchnetworking/definition/packet.

[9] "Types of Network Protocols, Explained," *CDW Research Hub*, available at https://www.cdw.com/content/cdw/en/articles/networking/types-of-network-protocols.html.

[10] "About the IETF", *Internet Society*, available at https://www.internetsociety.org/about-the-ietf/.

24. In addition to clients and servers, another essential component of the client-server architecture are IP addresses. IP addresses are a sequence of numbers that provide the network location of a device, such as a server or client. To send an IP message to a server, a client must know the IP address of the server.

25. There are two formats of IP addresses used today: IP version 4 (IPv4) and IP version 6 (IPv6).[11] As the Internet was gaining popularity, IPv4 addresses were being allocated at a fast pace and work began to develop the next version of the IP protocol, IPv6, which allowed for more internet addresses.[12] Since IPv6 allows for more addresses than IPv4, the formats of these addresses are different.[13] An IPv4 address has a format where four decimal numbers between 0 and 255 are separated by a period (e.g., 192.1.1.0).[14] An IPv6 address has a format where 8 hexadecimal numbers between 0 and FFFF are separated by a colon (e.g., 2001:0db8:3333:4444:5555:6666:7777:8888).[15]

26. Because IP addresses are a sequence of numbers, they are not a convenient way for a typical user to navigate the Internet. IP addresses are therefore mapped to a more user-friendly

---

[11] Kurose, James F. & Ross, Keith W., "Computer Networking: A Top-Down Approach," 8th Edition, Pearson, 2021., p. 330.

[12] Kurose, James F. & Ross, Keith W., "Computer Networking: A Top-Down Approach," 8th Edition, Pearson, 2021., pp. 347-348.

[13] Kurose, James F. & Ross, Keith W., "Computer Networking: A Top-Down Approach," 8th Edition, Pearson, 2021., pp. 348.

[14] "IPv4 and IPv6 address formats," *IBM*, March 2, 2021, available at https://www.ibm.com/docs/en/ts3500-tape-library?topic=functionality-ipv4-ipv6-address-formats.

[15] "IPv4 and IPv6 address formats," *IBM*, March 2, 2021, available at https://www.ibm.com/docs/en/ts3500-tape-library?topic=functionality-ipv4-ipv6-address-formats.

domain name, such as "*google.com.*" This mapping is done using the Domain Name System ("DNS"). The DNS acts as a directory for the Internet by mapping domain names to IP addresses.[16] When a user types a domain name in the address bar of their browser, as illustrated in **Figure 1** below, the browser may submit a request to a DNS server to obtain an IP address corresponding to the domain name.[17]

Figure 1
Example of Domain in Browser Address Bar

27. IP addresses can also be shared among multiple devices. For example, when multiple devices are connected to the Internet in an office via a router, the IP address of the router can be shared among multiple devices and acts as their "public" IP address. Devices connected to the Internet through the router can be assigned "private" IP addresses inside the home or business network, and those private IP addresses are not observed publicly on the Internet.[18]

---

[16] Kurose, James F. & Ross, Keith W., "Computer Networking: A Top-Down Approach," 8th Edition, Pearson, 2021, p. 123 ("People prefer the more mnemonic hostname identifier, while routers prefer [] IP addresses. In order to reconcile these preferences, we need a directory service that translates hostnames to IP addresses. This is the main task of the Internet's domain name system (DNS).").

[17] Kurose, James F. & Ross, Keith W., "Computer Networking: A Top-Down Approach," 8th Edition, Pearson, 2021, p. 124 ("The browser extracts the hostname [] from the URL and passes the hostname to the client side of the DNS application.").

[18] Specifically, this type of network setup refers to the widely deployed Network Address Translation (NAT) address allocation approach. *See* Kurose, James F. & Ross, Keith W., "Computer Networking: A Top-Down Approach," 8th Edition, Pearson, 2021, pp. 344-347 ("The NAT-enabled router does not *look* like a router to the outside world. Instead, the NAT router behaves to the outside world as a *single* device with a *single* IP address…In essence, the NAT-enabled router is hiding the details of the home network from the outside world.").

28. Further, IP addresses for devices may be dynamic or static. As the names suggest, a dynamic IP address is one that is assigned by the internet service provider and changes periodically depending on the ISP. The reason for this is that it is more cost effective for the internet service provider to reuse IP addresses.[19] A static IP address is a fixed IP address that is assigned by the internet service provider and does not change in most circumstances. Static IP addresses are typically used by internet service providers and businesses, not by individuals, whose devices would typically be assigned a dynamic IP address.[20]

B. How Web Browsing Operates

29. Web browsing is a type of Internet communication that relies on client-server architecture in which websites and third-party services typically play the role of servers, while devices with browsers play the role of clients.

30. Web browsers are applications that communicate with servers and display information for users on a screen. Browsers contain three main components that enable their functionality. One is a rendering engine that renders the layout of the website to display it for a user. This involves transforming Hypertext Markup Language (HTML) and Cascading Style Sheets (CSS) documents to webpages that users can interact with. A second component is a scripting engine that enables the functionality of dynamic elements of webpages such as banners,

[19] "Static vs. dynamic IP addresses," *Google Fiber Help*, *Google*, available at https://support.google.com/fiber/answer/3547208?hl=en; Prime, Joshua, "What is a Dynamic IP Address?" *OpenDNS*, available at https://support.opendns.com/hc/en-us/articles/227987827-What-is-a-Dynamic-IP-Address-.

[20] "Static vs. dynamic IP addresses," *Google Fiber Help*, *Google*, available at https://support.google.com/fiber/answer/3547208?hl=en; Prime, Joshua, "What is a Dynamic IP Address?" *OpenDNS*, available at https://support.opendns.com/hc/en-us/articles/227987827-What-is-a-Dynamic-IP-Address-.

pop-up messages, or drop-down menus. Third, browsers contain a user interface to access features such as bookmarks, browsing history, or navigation buttons.

31. While there are many different browsers, their functionality is similar in many key aspects. For example, across browsers, a user enters a website address in the form of a Uniform Resource Locator (URL) in the respective bar of the browser as illustrated in **Figure 2** below.[21]

Figure 2
Example of URL to Access a Webpage

32. A URL generally has four sections. First, *https*://, specifies the protocol that is used to fetch this webpage. In the illustration above, *https://* is hidden but is indicated by the lock icon and would be displayed if the user clicks on the address bar to display the full URL. Second,

[21] Modern browsers do not even require users to know the exact URL of the Web resource. If a user enters a non-exact address or even words related to the desired Web resource, a browser will direct a user to the selected search engine which provides the user with a choice of the websites to visit.

en.wikipedia.org specifies the domain name of a website as was discussed above. Third, the remaining part of the URL, */wiki/Internet*, provides a path to a specific webpage on the website. Fourth, and not included in the example above, URLs may contain other parameters required by the server to process the information request or anchors, which instruct the browser to display a certain part of the webpage first.

33. Browsers and servers communicate via a series of request and response messages, using the HTTP protocol. HTTP is governed by a standardized set of rules and can deliver a variety of data types.[22] There are several types of HTTP requests, called "methods." GET and POST requests are two methods that are ubiquitous in modern web communications and are supported by all browsers. Other methods are PUT, HEAD, DELETE, PATCH, OPTIONS, CONNECT, and TRACE.[23]

34. An HTTP GET request is used by browsers to retrieve specific information from a server. A typical example of a GET request is illustrated in **Figure 3**.[24] All HTTP requests contain information on the method (e.g., GET) and the version of HTTP protocol (e.g., HTTP/1.1). The remaining part of the request are headers that include different fields depending on website functionality. Most HTTP requests contain such headers as "User-Agent" (informs the server about

---

22 Kurose, James F. & Ross, Keith W., "Computer Networking: A Top-Down Approach," 8th Edition, Pearson, 2021, pp. 96-101.

23 "HTTP Request Methods," *W3 Schools*, available at https://www.w3schools.com/tags/ref_httpmethods.asp.

24 An example presented below is obtained by visiting *https://www.hbr.org*. I record transmissions using Fiddler Everywhere. The examples illustrated in **Figure 3** and **Figure 4** are screenshots from a Fiddler Everywhere window of the request associated with domain *hbr.org*. This request is one of many requests that are triggered while accessing *https://www.hbr.org*. I select to report a given request for illustrative purposes.

the web browser and is used to improve browsing experience), "Accept-Language" (informs a server about the language of a user), and "Host" (contains information of the domain that receives a request). HTTP requests can also in certain instances contain cookie information, which I discuss in paragraph **38** below. Cookie values may be included in a "Cookie" HTTP header, or alternatively may be included as a URL parameter. The example of an HTTP request presented in **Figure 3** is not an exhaustive list of headers that could be present in an HTTP request.

Figure 3
Example of HTTP Request

Request / HTTP/1.1 GET

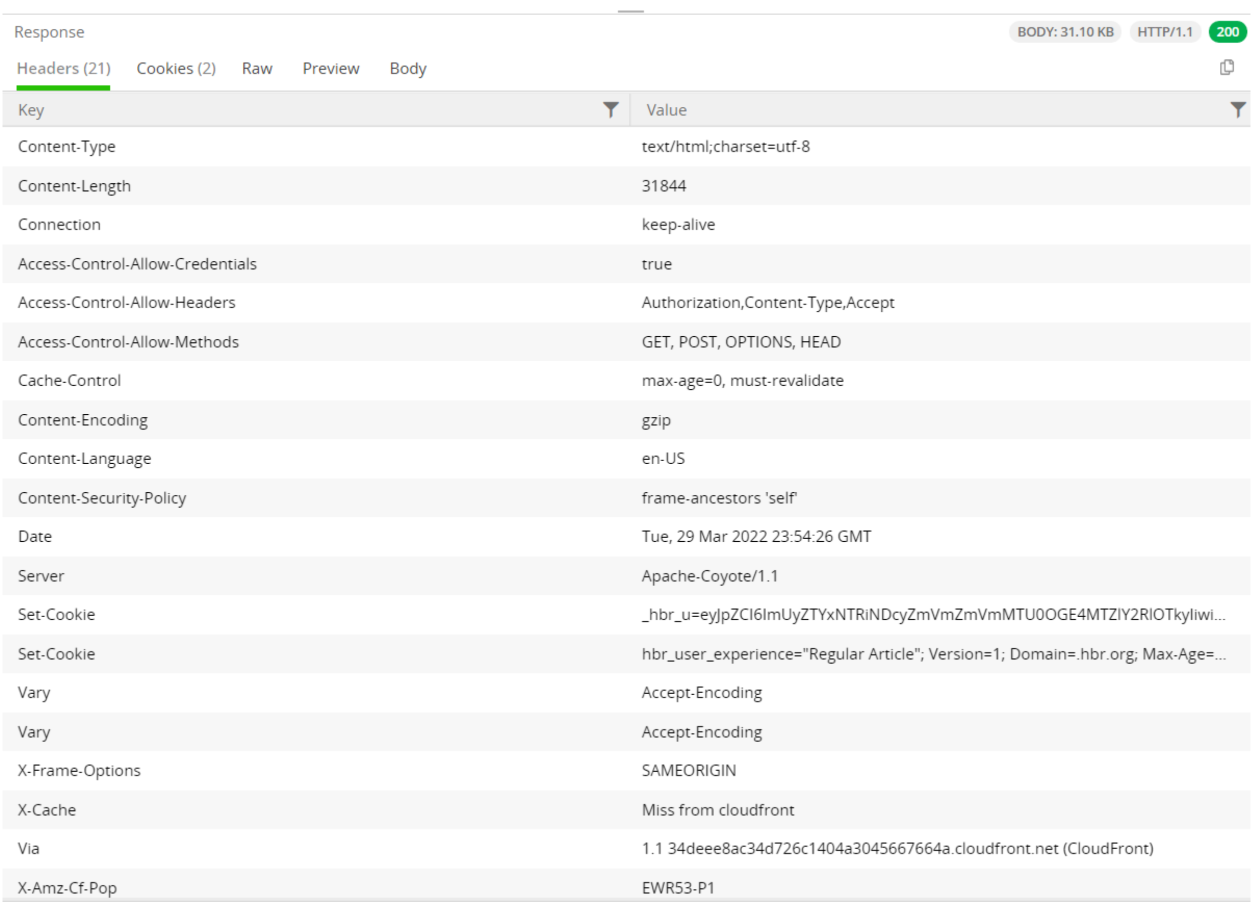
Headers (16) Params (0) Cookies (43) Raw Body

Key	Value
Host	hbr.org
Connection	keep-alive
Cache-Control	max-age=0
sec-ch-ua	"(Not(A:Brand";v="8", "Chromium";v="99", "Google Chrome";v="99"
sec-ch-ua-mobile	?0
sec-ch-ua-platform	"Windows"
Upgrade-Insecure-Requests	1
User-Agent	Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, lik...
Accept	text/html,application/xhtml+xml,application/xml;q=0.9,image/avif,image/w...
Sec-Fetch-Site	none
Sec-Fetch-Mode	navigate
Sec-Fetch-User	?1
Sec-Fetch-Dest	document
Accept-Encoding	gzip, deflate, br
Accept-Language	en-US,en;q=0.9
Cookie	_hbr_u=eyJpZCI6ImUyZTYxNTRiNDcyZmVmZmVmMTU0OGE4MTZlY2RlOTk...

35. After it receives a GET request such as the one illustrated in **Figure 3**, the server typically sends back a response. An example of such a response is illustrated in **Figure 4**. Responses typically contain the status of the request which is "200" in **Figure 4**. The status of a request can take different values such as "200" denoting success ("OK") or "400" denoting failure

("Bad Request").[25] A response to a GET request would typically contain headers such as "Date" (displays date and time of the request), "Content-Length" (displays the size of an HTTP response message), or "Content-Language" (informs about the language of the response text). Responses can also contain cookie information sent from the server to a browser. In the HTTP response shown in **Figure 4**, cookie information is contained in a "Set-Cookie" header.

Figure 4
Example of HTTP Response



Key	Value
Content-Type	text/html;charset=utf-8
Content-Length	31844
Connection	keep-alive
Access-Control-Allow-Credentials	true
Access-Control-Allow-Headers	Authorization,Content-Type,Accept
Access-Control-Allow-Methods	GET, POST, OPTIONS, HEAD
Cache-Control	max-age=0, must-revalidate
Content-Encoding	gzip
Content-Language	en-US
Content-Security-Policy	frame-ancestors 'self'
Date	Tue, 29 Mar 2022 23:54:26 GMT
Server	Apache-Coyote/1.1
Set-Cookie	_hbr_u=eyJpZCI6ImUyZTYxNTRiNDcyZmVmZmVmMTU0OGE4MTZlY2RlOTkyIiwi...
Set-Cookie	hbr_user_experience="Regular Article"; Version=1; Domain=.hbr.org; Max-Age=...
Vary	Accept-Encoding
Vary	Accept-Encoding
X-Frame-Options	SAMEORIGIN
X-Cache	Miss from cloudfront
Via	1.1 34deee8ac34d726c1404a3045667664a.cloudfront.net (CloudFront)
X-Amz-Cf-Pop	EWR53-P1

---

25 "HTTP Status Messages," *W3 Schools*, available at https://www.w3schools.com/tags/ref_httpmessages.asp.

36. In contrast to GET requests, POST methods are typically used to create or update records on the server.[26] An example of a POST request could be a message sent by a browser when a user fills in and submits a form on a website. However, POST requests are not always triggered by a web form and can also be a result of website functionality such as XMLHttpRequest which is a technology that allows servers to retrieve information from a URL without refreshing a webpage and interrupting user's interactions with a website.[27,28,29] In many instances, web developers' choice whether to use GET or POST requests is affected not only by whether they intend to display or modify the data but also by other technical and security considerations. Therefore, it is common to see GET and POST requests being used interchangeably in certain instances.[30]

37. An example of a POST request is illustrated in **Figure 5** below. It has a similar structure to GET requests and contains similar headers. This POST request also contains a body, shown in **Figure 6**, which contains information that the server could use to update records. However, not all POST requests will contain information in the body, and whether a POST request does contain that information depends on the implementation of the webpage. Also similar to GET

[26] "HTTP Request Methods," *W3 Schools*, available at https://www.w3schools.com/tags/ref_httpmethods.asp.

[27] "POST," *MDN Web Docs, Mozilla,* available at https://developer.mozilla.org/en-US/docs/Web/HTTP/Methods/POST.

[28] "XMLHttpRequest," *MDN Web Docs, Mozilla,* available at https://developer.mozilla.org/en-US/docs/Web/API/XMLHttpRequest.

[29] "XML HttpRequest," *W3 Schools*, available at https://www.w3schools.com/xml/xml_http.asp.

[30] "URIs, Addressability, and the use of HTTP GET and POST," *World Wide Web Consortium,* March 21, 2004, available at https://www.w3.org/2001/tag/doc/whenToUseGet.html#checklist.

requests, after receiving a POST request the server typically sends an HTTP response with similar structure to responses associated with GET requests, as illustrated in **Figure 7**.[31]

Figure 5
Example of HTTP POST Request

Request /rest/v1/delivery?client=harvardbusinessr HTTP/1.1 POST

Headers (16) Params (3) Cookies (0) Raw Body

Key	Value
Host	harvardbusinessrevie.tt.omtrdc.net
Connection	keep-alive
Content-Length	1757
sec-ch-ua	"(Not(A:Brand";v="8", "Chromium";v="99", "Google Chrome";v="99"
sec-ch-ua-mobile	?0
User-Agent	Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Ge...
sec-ch-ua-platform	"Windows"
Content-Type	text/plain
Accept	*/*
Origin	https://hbr.org
Sec-Fetch-Site	cross-site
Sec-Fetch-Mode	cors
Sec-Fetch-Dest	empty
Referer	https://hbr.org/
Accept-Encoding	gzip, deflate, br
Accept-Language	en-US,en;q=0.9

[31] **Figure 5**, **Figure 6**, and **Figure 7** are examples obtained using Fiddler as a result of accessing *https://www.hbr.org*.

Figure 6
Example of HTTP POST Request Body

Request   /rest/v1/delivery?client=harvardbusinessr   HTTP/1.1   POST

Headers (16)   Params (3)   Cookies (0)   Raw   Body

Text   JSON   Form-Data   XML

1 {"requestId":"efd1a2974eff4bb69fa52637ec563057","context":{"userAgent":"Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/99.0.4844.84 Safari/537.36","timeOffsetInMinutes":-240,"channel":"web", "screen":{"width":2048,"height":1153,"orientation":"landscape","colorDepth":24,"pixelRatio":1.25},"window": {"width":2031,"height":1042},"browser":{"host":"hbr.org","webGLRenderer":"ANGLE (Intel, Intel(R) UHD Graphics Direct3D11 vs_5_0 ps_5_0, D3D11-27.20.100.8681)"},"address":{"url":"https://hbr.org/","referringUrl":""}},"id": {"tntId":"efbe24ca3c8a4a1aa38843f87f484c31.34_0","marketingCloudVisitorId":"14407160023127328754367229254183951616"}, "property":{"token":"9894f7f6-8975-24b0-5014-adac6f8e648a"},"experienceCloud":{"audienceManager":{"locationHint":7, "blob":"j8Odv6LonN4r3an7LhD3WZrU1bUpAkFkkiY1ncBR96t2PTI"},"analytics":{"logging":"server_side", "supplementalDataId":"60963EEE46F90E19-7D4BD10D553260AC","trackingServer":"hbr.sc.omtrdc.net", "trackingServerSecure":"hbr.sc.omtrdc.net"}},"execute":{"pageLoad":{"parameters":{"pageID":"LANDING:Harvard Business Review - Ideas and Advice for Leaders","pageName":"Homepage: Harvard Business Review - Ideas and Advice for Leaders", "userState":"Guest","excludedIds":"null,undefined,null,null","pageLanguage":"en","articleTemplate":"standard", "articlesRemaining":"2","hbrExperienceCookie":"Regular Article"}}},"prefetch":{"views":[{"parameters": {"pageID":"LANDING:Harvard Business Review - Ideas and Advice for Leaders","pageName":"Homepage: Harvard Business Review - Ideas and Advice for Leaders","userState":"Guest","excludedIds":"null,undefined,null,null", "pageLanguage":"en","articleTemplate":"standard","articlesRemaining":"2","hbrExperienceCookie":"Regular Article"}}]}}

Figure 7
Example of HTTP POST Response

Response   BODY: 1.99 KB   HTTP/1.1   200

Headers (10)   Cookies (0)   Raw   Preview   Body

Key	Value
Date	Tue, 29 Mar 2022 23:54:27 GMT
Content-Type	application/json;charset=UTF-8
Transfer-Encoding	chunked
Connection	keep-alive
Vary	origin,access-control-request-method,access-control-request-headers,accept-en...
Access-Control-Allow-Origin	https://hbr.org
Access-Control-Allow-Credentials	true
X-Request-ID	9a1e3e4587b705a92bad1a471934ae73
Timing-Allow-Origin	*
Content-Encoding	gzip

38. It is common for a request for a webpage to trigger many other requests to the same or other domains. There are multiple reasons for this. One reason is that the content of a webpage

may reside on many different servers. For example, a website owner might choose to store the HTML code for a webpage on one server, and files containing images and other content to be displayed on a different server. In this simple example, when a browser contacts the website server for the HTML code, the browser's execution of that code will trigger multiple additional requests from the browser to other servers to retrieve images and other content that the designer desires to be displayed on the webpage.

39. Another reason that a request for a webpage may trigger additional requests is that many websites make use of third-party services that provide features or functionality that the website owner desires but does not have the resources to develop themselves. Use of these third-party services allows for efficient software development by leveraging code reusability, allowing separate entities to develop and maintain a smaller part of code. Examples of third-party services include Google Analytics (a website analytics product), Google Ad Manager (an ad management platform for publishers), Stripe and PayPal (allows websites to accept payments), Adobe Analytics (website analytics), Meta Pixel (personalized advertising), and Bootstrap (website styling).[32] These complex services would be infeasible to develop and maintain for most large websites let alone small websites in terms of both costs and required expertise.[33] Instead, website owners utilize

[32] "Analytics anywhere in the customer journey," *Adobe Analytics*, *Adobe*, available at https://www.adobe.com/analytics/adobe-analytics.html; Bacinger, Tomislav, "What is Bootstrap? A Short Bootstrap Tutorial on the What, Why, and How," *TopTotal*, available at https://www.toptal.com/front-end/what-is-bootstrap-a-short-tutorial-on-the-what-why-and-how; Kopachovets, Oleg, "3rd Party API [Benefits, Our Experience, How-To]," *PRCoders*, October 6, 2021, available at https://procoders.tech/blog/how-to-integrate-third-party-api/ and Vrountas, Ted, "What is Meta Pixel & What Does it Do?" *Instapage by Postclick*, February 14, 2022, available at https://instapage.com/blog/meta-pixel.

[33] For example, Uber relied on the Google Maps API to create its app. Without this third-party API, Uber would have had to develop its own mapping software, which would have required a huge hiring increase, or make drivers responsible for their own route. *See* "APIs: The Proven Tool for Efficient Business Growth," *Axos Bank*, July 1, 2020, available at

one or more third-party services by incorporating HTML code in their webpages that results in HTTP requests being sent to domains associated with the third-party services.

40. HTTP messages may also contain cookies. Cookies are small files stored on a browser. Information contained in cookies allows websites to associate and recall information to enable certain website functionalities and improve user experience. For example, some cookies contain information about user preferences such as language or login status.[34] When a user opens the website again, their preferred language is automatically chosen for display. Similarly, a user will not need to spend time to login to a website again if cookies allow the website to "remember" a user's login status. Cookies also enable other functionalities such as website analytics and personalized advertising.

41. Cookies sent in an HTTP request contain various fields as displayed in **Figure 8**. For example, they include such fields as "name" (name of the cookie), "domain" (website to which

---

https://www.axosbank.com/blog/APIs-The-Proven-Tool-for-Efficient-Business-Growth#. Businesses can benefit from using APIs. *See e.g.,* "Growing your business with APIs," *Visa*, available at https://usa.visa.com/content/dam/VCOM/download/partner-with-us/growing-business-api-whitepaper.pdf, "Three Ways APIs Are Keeping Small Businesses Digitally Competitive," *Small Business Trends*, February 10, 2022, available at https://smallbiztrends.com/2022/02/api-and-digital-transformation.html ("Yet, many small businesses aren't set up to collect the data and insights they need to truly understand their customers. And to be fair, terms like "database" and "SQL" don't exactly signal an easy learning curve. With APIs, however, small businesses can easily and affordably capture the customer insights they need to drive better customer experiences.").

[34] "What are cookies | Cookies definition," *Cloudflare*, available at https://www.cloudflare.com/learning/privacy/what-are-cookies/.

the cookie belongs), "expires" (date and time when the cookie record will expire), and "value" (the value associated with the cookie).[35]

Figure 8
First-Party Cookie Example


```
"cookies": [
  {
    "name": "_hbr_u",
    "value": "eyJpZCI6IjAwYzZiOGUxMGZlZGMzMzdmMzQ5NmJkOTljMDgwODM5IiwibGFzdFZpc2l0ZWQiOjE2NDg2NDYwODE4NTZ9",
    "path": "/",
    "domain": ".hbr.org",
    "expires": "2025-03-29T13:14:41.771Z",
    "httpOnly": false,
    "secure": true
  },
```


42. There are several types of cookies:

a. Session cookies are stored on a user's device only for the duration of the current browsing session after which they are deleted.[36]

b. Persistent or permanent cookies, in contrast to session cookies, are not deleted from a user's device after the session is over. Instead, these cookies persist on the user's device until they expire or until they are deleted by the user.[37]

c. First-party cookies are set by the website that a user is currently visiting. For example, if a user visits *https://hbr.org/,* first-party cookies would be those that are set by the

[35] Figure 8 is obtained by accessing *https://hbr.org/* and recording data transmission using Developer Tools for illustrative purposes. The screenshot is taken of the associated HAR file that contains data transmission logs. This HAR file is provided in my backup "hbr.har".

[36] "Using HTTP cookies," *MDN Web Docs, Mozilla,* available at https://developer.mozilla.org/en-US/docs/Web/HTTP/Cookies.

[37] Persistent cookies can also be deleted based on certain browser settings, as discussed in **Section IV** below. "Using HTTP cookies," *MDN Web Docs, Mozilla,* available at https://developer.mozilla.org/en-US/docs/Web/HTTP/Cookies; "Client-side Storage," *World Wide Web Consortium*, available at https://www.w3.org/2001/tag/2010/09/ClientSideStorage.html.

hbr.org domain. **Figure 8** above is an example of a first-party *_hbr_u* cookie set by *https://hbr.org/*.[38] A first-party cookie can also be set by a website in conjunction with its use of a third-party service. For example, if a website owner chooses to make use of Google Analytics, the Google Analytics JavaScript code that the website owner incorporates into the website's HTML code will set one or more first-party cookies that are associated with the website and are used to facilitate the website analytics functionality provided by Google Analytics.[39]

d. In contrast to first-party cookies, third-party cookies are those set by an entity or service other than the website that a user is currently visiting. Third-party cookies are often set because the website developer has chosen to use an entity or service that sets these cookies for a specific purpose such as advertising.[40] For example, after visiting *http://www.hbr.org/*, I observe the *demdex* cookies associated with third-party domain *demdex.net* as illustrated in Figure 9 below.

Figure 9
Third-Party Cookie Example


```
"cookies": [
  {
    "name": "demdex",
    "value": "63679519175725716364365546944474323367",
    "path": "/",
    "domain": ".demdex.net",
    "expires": "2022-09-26T13:14:42.277Z",
    "httpOnly": false,
    "secure": true,
    "sameSite": "None"
  }
],
```


38 "What is a First-Party Cookie?" *CookiePro Knowledgebase*, September 17, 2021, available at https://www.cookiepro.com/knowledge/what-is-a-first-party-cookie/.

39 JavaScript is a programming language that enables complex features on web pages.

40 "Guide to Third-party Cookies," *CookieYes*, March 24, 2022, available at https://www.cookieyes.com/blog/third-party-cookies/.

IV. PRIVATE BROWSING MODE

A. Overview of Private Browsing Mode

43. Private Browsing Modes are offered on all major browsers. These modes have different names depending on the browser: e.g., *Incognito* in Chrome, *InPrivate* in Microsoft Edge, *private window* in Firefox. Across browsers, Private Browsing Mode is generally not designed to provide complete user anonymity on the Web. Instead, it is designed to conceal the user's activity from other people who may use the same device and to prevent linking the user's browsing activity in Private Browsing Mode with the user's browsing activity in Regular Mode.[41]

44. Private Browsing Mode functionality varies by browser. However, most browsers' Private Browsing Mode behaves as follows: Each Private Browsing Session begins with an empty "cookie jar," such that cookies previously set on the browser in Regular Mode or in previous Private Browsing Sessions are not associated with or available in the current Private Browsing Session. When the browser is in Private Browsing Mode, however, new cookies are set in the new "cookie jar" (to the extent websites attempt to do so and it is allowed by the browser's cookie settings), and browsing history is maintained (within the Private Browsing Session or specific Private Browsing Tab). A Private Browsing Session can involve multiple browser tabs or windows, and cookies and browsing history within the Private Browsing Session will be available to each tab and window that is part of that Private Browsing Session.[42] Most browsers' Private

---

[41] "W3C TAG Observations on Private Browsing Modes," *World Wide Web Consortium*, April 9, 2020, available at https://w3ctag.github.io/private-browsing-modes/#evolving.

[42] *See, e.g.*, "Google Chrome Privacy Notice," *Google Chrome*, *Google*, September 23, 2021, available at https://www.google.com/chrome/privacy/ ("[s]ites may deposit new cookies on your system while you are in these modes, but they'll only be stored and transmitted until you close the last incognito or guest window."); "Search & browse privately", *Google Search Help*, *Google*, available at

Browsing Modes will discard cookies, browsing history, passwords and any information entered into Web forms once the Private Browsing Session is closed.[43] In contrast, in Regular Mode these types of information are retained in the browser's memory and thus would be available in subsequent Regular Mode sessions.[44]

45. For example, consider a user who opens a Private Browsing Session, visits a retail website (e.g., *https://www.amazon.com/*), and adds an item to her cart without logging in to the website.[45] The retail site can place a cookie (subject to the browser's cookie settings) to remember

---

https://support.google.com/websearch/answer/4540094?hl=en&co=GENIE.Platform%3DDesktop ("[c]ookies are deleted after you close your private browsing window or tab" and "you might see search results and suggestions based on your location or other searches you've done during your current browsing session."); "How private browsing works in Chrome," *Google Chrome Help*, *Google*, available at https://support.google.com/chrome/answer/7440301?hl=en. ("[c]ookies and site data are remembered while you're browsing, but deleted when you exit Incognito mode."); "How Chrome Incognito keeps your browsing private," *Google Chrome Help*, *Google*, available at https://support.google.com/chrome/answer/9845881 ("[a]fter you close all Incognito windows, websites won't be able to serve ads to you based on your signed-out activity during that closed session."); "How Google uses information from sites or apps that use our services," *Google Privacy & Terms*, *Google*, available at https://policies.google.com/technologies/partner-sites ("Incognito mode in Chrome allows you to browse the web without recording webpages and files in your browser or Account history (unless you choose to sign in). Cookies are deleted after you've closed all of your incognito windows and tabs…").

43 "How private browsing works in Chrome," *Google Chrome Help*, *Google*, available at https://support.google.com/chrome/answer/7440301?hl=en&ref_topic=9845306. "Browse InPrivate in Microsoft Edge," *Microsoft Support*, *Microsoft*, https://support.microsoft.com/en-us/microsoft-edge/browse-inprivate-in-microsoft-edge-cd2c9a48-0bc4-b98e-5e46-ac40c84e27e2; "Incognito browser: What it really means," *Mozilla*, available at https://www.mozilla.org/en-US/firefox/browsers/incognito-browser/; "Use Private Browsing in Safari on Mac," *Apple Support*, *Apple*, available at https://support.apple.com/guide/safari/browse-privately-ibrw1069/mac.

44 "Computer Cookies: What They Are and How They Work," *HP Tech Takes*, November 26, 2018, available at https://www.hp.com/us-en/shop/tech-takes/what-are-computer-cookies.

45 If a user logs in to the website in Private Browsing Mode, the website might keep records of a user's cart associated with the user's account. In this scenario, where shopping cart information

that this browser was used to place an item into a shopping cart. If the user navigates away from the retail website and then returns to the website in the same Private Browsing Session (for Safari within the same tab), the item can still appear in her cart based on the stored cookie value, which is available within the Private Browsing Session. However, if the user ends the Private Browsing Session completely and then opens another session (either in Private Browsing Mode or Regular Mode), the item will not appear in her cart because cookies set in Private Browsing Mode are discarded at the end of each Private Browsing Session and the Web server would have no cookie to associate the user's prior visit while in Private Browsing Mode with the subsequent visit after that session has closed. This behavior is illustrated in the following screenshot. I visited *https://www.amazon.com/* in Incognito Mode in Chrome and added an item to a cart. Next, I closed the Incognito Mode session and opened a Regular Mode session where I was not logged into Amazon. I observed no items in the cart.

associated with the user's website account is maintained at the website's server, deleting cookies after the session would not prevent the website from remembering what is in the cart, even after the Private Browsing Session is over.

Figure 10
Amazon.com Cart in Incognito Mode

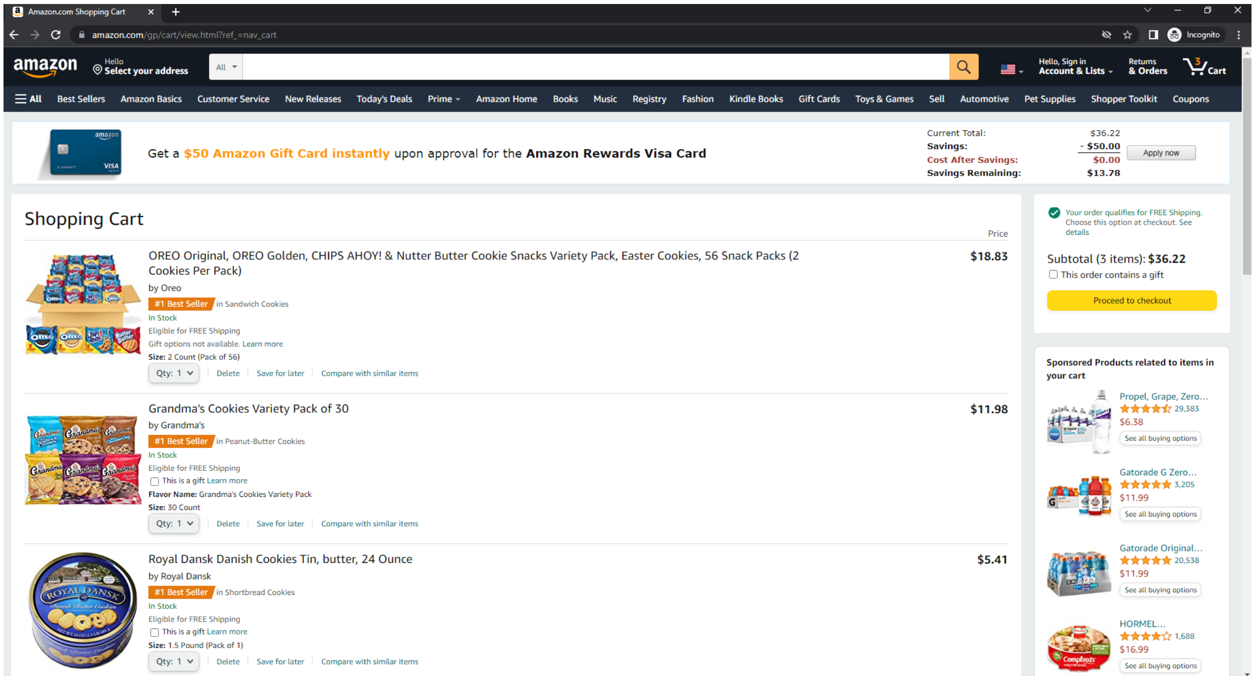
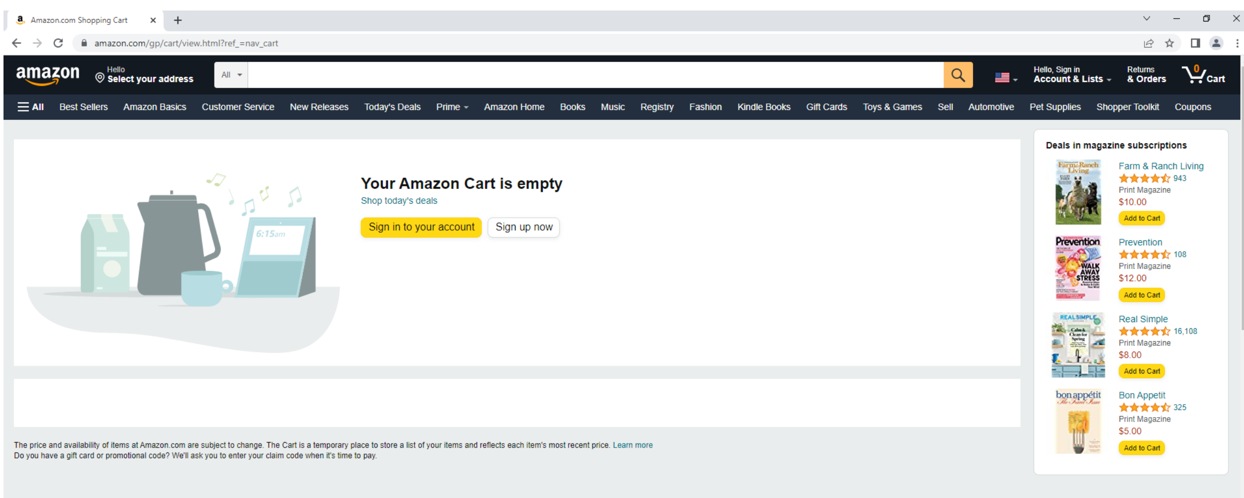


Figure 11
Empty Amazon.com Cart in Subsequent Normal Mode Session



46. Private Browsing Mode is not designed to and does not affect many aspects of data transmission.[46] For example:

- **The Setting and Sending of Cookies Placed on the Browser *During* a Private Browsing Session**. In Private Browsing Sessions, cookies are still set and sent as required by functionality of websites, to the extent allowed by the browser's cookie settings. However, any cookie values set during a Private Browsing Session are only available for the duration of that session.[47] Once the Private Browsing Session ends

[46] *See, e.g.*, "Browse in private," *Google Chrome Help*, *Google*, available at https://support.google.com/chrome/answer/95464?hl=en&co=GENIE.Platform%3DDesktop ("[y]our activity isn't hidden from websites you visit, your employer or school, or your internet service provider."); "How private browsing works in Chrome," *Google Chrome Help*, *Google*, available at https://support.google.com/chrome/answer/7440301?hl=en ("[y]our activity, like your location, might still be visible to: [w]ebsites you visit, including the ads and resources on those sites[;] [w]ebsites you sign in to; [y]our employer, school, or whoever runs the networks you're using[;] [y]our internet service provider[; and] [s]earch engine."); *id.* ("[a] web service, website, search engine, or provider may be able to see [y]our IP address, which can be used to identify the general area you're in[;] [y]our activity when you use a web services[;] [y]our identity if you sign into a web services, like Gmail."); "How Chrome Incognito keeps your browsing private," *Google Chrome Help*, *Google*, available at https://support.google.com/chrome/answer/9845881 ("[w]hat Incognito mode doesn't do" including: "[p]revent your activity or location from being visible to the websites you visit, your school, employer, or your Internet Service provider" or "[p]revent the websites you visit from serving ads based on your activity during an Incognito session."); "How Google uses information from sites or apps that use our services," *Google Privacy & Terms*, *Google*, available at https://policies.google.com/technologies/partner-sites ("when you visit a website that uses advertising services like AdSense, including Analytics tools like Google Analytics, or embed video content from YouTube, your web browser automatically sends certain information to Google. This includes the URL of the page you're visiting and your IP address. We may also set cookies on your browser or read cookies that are already there.").

[47] Cranor, Lorrie & Habib, Hana, "Private browsing: What it does - and doesn't do - to shield you from prying eyes on the web," *The Conversation,* July 30, 2020, available at https://theconversation.com/private-browsing-what-it-does-and-doesnt-do-to-shield-you-from-prying-eyes-on-the-web-142445.

(e.g., when the user closes all Incognito Mode tabs in Chrome), those cookies set during the Private Browsing Session are discarded and not available in subsequent sessions.

- **Execution of JavaScript Code**. Private Browsing Modes generally do not prevent execution of JavaScript code embedded in website source code. As a result, actions triggered by JavaScript would not be prevented in Private Browsing Mode, unless those actions would require use of functionality that is otherwise restricted (e.g., if third-party cookies were blocked).[48]

- **A User's External IP Address**: Private Browsing Modes are not designed to mask a user's external IP address. IP addresses (whether the device's actual IP address or one that has been masked by a VPN service) will still be sent to websites because an IP address is required for Internet communications. Specifically, IP addresses identify where information should be delivered, and Web communication cannot occur without use of IP addresses.

B. Implementation of Private Browsing Mode in Popular Browsers

47. The specifics of how Private Browsing Mode is implemented varies depending on the browser and browser version.[49] One dimension along which Private Browsing Mode can differ

[48] *See e.g.*, "Does firefox prevent sites and javascript code from accessing existing cookies and web sites data when browsing in Private Browsing mode?" *Support Mozilla*, *Mozilla Corporation*, February 24, 2019, available at https://support.mozilla.org/en-US/questions/1251227.

[49] Implementation of Private Browsing Mode has changed over time. Unless otherwise noted, my description is focused on the current implementation of Private Browsing Modes on various browsers.

by browser is its default treatment of cookies.[50] For example, Incognito Mode in Chrome blocks third-party cookies by default but this setting can be adjusted by the user.[51] The current Private Browsing Mode implementation of Firefox blocks some cookies by default, but this cookie setting can be modified by the user.[52] In Safari's Private Browsing Mode, a user's cookie settings are carried over from their Regular Mode settings, which block third-party cookies by default (again, those cookie settings can be changed by the user).[53] Similarly, for InPrivate mode in Edge, tracking prevention is set to "Balanced" by default, meaning that the browser blocks potentially harmful

[50] *See e.g.,* Mardini, AbdelKarim, "More intuitive privacy and security controls in Chrome," *The Keyword*, *Google*, May 19, 2020, available at https://blog.google/products/chrome/more-intuitive-privacy-and-security-controls-chrome/; "How do I turn on the Do Not Track feature," *Support Mozilla*, *Mozilla Corporation*, available at https://support.mozilla.org/en-US/kb/how-do-i-turn-do-not-track-feature; "Temporarily allow cookies and site data in Microsoft Edge," *Microsoft Edge Support*, *Microsoft,* available at https://support.microsoft.com/en-us/microsoft-edge/temporarily-allow-cookies-and-site-data-in-microsoft-edge-597f04f2-c0ce-f08c-7c2b-541086362bd2; "Tracking prevention in Microsoft Edge," *Microsoft*, available at https://docs.microsoft.com/en-us/microsoft-edge/web-platform/tracking-prevention.

[51] Chrome's Incognito Mode blocks third-party cookies starting from version 83, released in May 2020 (*See e.g.*, Protalinski, Emil, "Chrome 83 arrives with redesigned security settings, third-party cookies blocked in Incognito" *VentureBeat*, May 19, 2020, available at https://venturebeat.com/2020/05/19/google-chrome-83/.

[52] Firefox's Private Browsing Mode blocks third party cookies starting from version 89, released in June 2021 (*See e.g.*, Edelstein, Arthur, "Firefox 89 blocks cross-site cookie tracking by default in private browsing," *Mozilla Security Blog*, *Mozilla Corporation*, June 1, 2021, available at https://blog.mozilla.org/security/2021/06/01/total-cookie-protection-in-private-browsing/).

[53] "cookies and website data," *Apple Support*, *Apple*, available at https://support.apple.com/guide/safari/aside/glos0126d795/15.1/mac/12.0; Blumenthal, Eli, "Apple updates Safari on iOS to block third-party cookies," *CNET*, March 25, 2020, available at https://www.cnet.com/tech/computing/apple-updates-safari-on-ios-and-mac-to-block-third-party-cookies/.

content, and trackers from sites the user has not visited before, but does not block ads and still permits some degree of ad personalization.[54]

48. Private Browsing Modes in popular browsers also differ in their implementation of extensions. Browser extensions can perform various actions including but not limited to executing additional tracker blocking and privacy measures. In Chrome,[55] Firefox,[56] and Edge,[57] Private Browsing Mode disables extensions by default. However, users can also enable extensions on all of these browsers in Private Browsing Mode. By contrast, Safari's Private Browsing Mode allows extensions by default, and a user can opt to disallow them.[58]

49. Private Browsing Mode is not the default browsing mode in the browsers described in this report; a user has to take an explicit action to enter Private Browsing Mode. However, opening a Private Browsing Mode window normally requires no more than a few clicks. To illustrate, I will focus on how to open a Private Browsing Mode window on a Windows desktop. In Chrome, a user can open an Incognito window by navigating to the Chrome control panel in the upper right-hand corner of the browser and selecting "New Incognito Window." Another way to open an Incognito window is by pressing Ctrl+Shift+N, a keyboard shortcut that is displayed next

---

[54] "Which Tracking Prevention Setting Should You Use in Microsoft Edge," *How-To Geek*, February 11, 2020, available at https://www.howtogeek.com/569951/which-tracking-prevention-setting-should-you-use-in-microsoft-edge/.

[55] "Allow private browsing," *Chrome Enterprise and Education Help*, *Google*, available at https://support.google.com/chrome/a/answer/9302896?hl=en.

[56] "Extensions in Private Browsing," *Support Mozilla*, *Mozilla*, available at https://support.mozilla.org/en-US/kb/extensions-private-browsing.

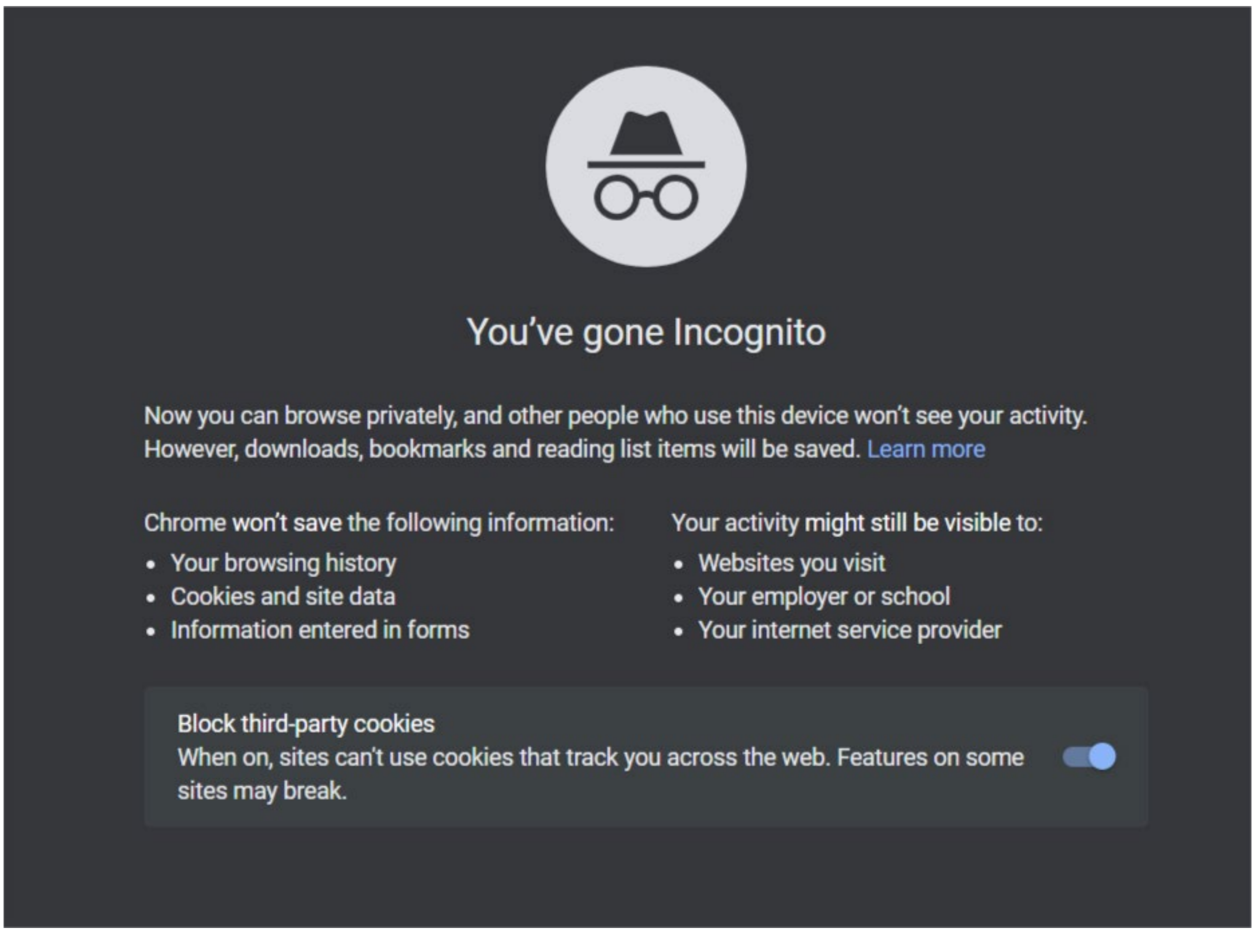
[57] "Browse InPrivate in Microsoft Edge," *Microsoft Support*, *Microsoft*, available at https://support.microsoft.com/en-us/microsoft-edge/browse-inprivate-in-microsoft-edge-cd2c9a48-0bc4-b98e-5e46-ac40c84e27e2.

[58] "Does Safari Web Extensions include Private Browsing?" *Developer Forums*, *Apple*, available at https://developer.apple.com/forums/thread/650294.

to the "New Incognito Window" option. Opening a Private Browsing Mode window works in much the same way for Edge, Firefox, and Safari.

50. Browsers typically include a page that explains the functionality of Private Browsing Mode every time a user opens a Private Browsing Mode window. For example, the Chrome Incognito splash screen, as seen below in **Figure 12**, states, among other things, that "other people who use this device won't see your activity."[59]

Figure 12
Incognito User Notification Page



[59] A splash screen is an introductory web page to greet visitors in a browser before they access any websites. See Kyrnin, Jennifer, "Splash Pages: Pros and Cons," *ThoughtCo.*, February 25, 2021, available at https://www.thoughtco.com/splash-pages-pros-cons-3469116.

51. It also states that "Chrome won't save the following information: Your browsing history; Cookies and site data; Information entered in forms." This is data that is typically stored locally on the user's browser in Regular Mode. However, the Incognito splash screen states that "downloads, bookmarks and reading list items will be saved." The Incognito splash screen also states that "Your activity might still be visible to: Websites you visit; Your employer or school; Your internet service provider."[60]

52. The Incognito splash screen also contains a link that provides a more detailed description of Incognito Mode. The linked page currently provides the following under the heading "How Incognito mode works":[61]

> When you first open a new Incognito window, you're creating a new Incognito browsing session. Any Incognito windows you open after that are part of the same session. You can end that Incognito session by closing all open Incognito windows.
>
> In Incognito, none of your browsing history, cookies and site data, or information entered in forms are saved on your device. This means your activity doesn't show up in your Chrome browser history, so people who also use your device won't see your activity. Websites see you as a new user and won't know who you are, as long as you don't sign in.
>
> If you're browsing in Chrome Incognito mode, you are, by default, not signed into any accounts or sites.

---

[60] Version 99.0.4844.82 (Official Build) (64-bit) as an example.

[61] Currently, the "Learn more" hyperlink (https://support.google.com/chrome/?p=incognito) redirects users to the "How Chrome Incognito keeps your browsing private" page, *Google Chrome Help, Google*, available at https://support.google.com/chrome/answer/9845881. Previously, the "Learn more" hyperlink redirected users to the "How private browsing works in Chrome" page, *Google Chrome Help*, *Google*, available at https://support.google.com/chrome/answer/7440301?hl=en. See, e.g., "How private browsing works," *Google*, archived by the *Wayback Machine*, May 03, 2020, available at https://web.archive.org/web/20200503180118/https://support.google.com/chrome/?p=incognito.

Your school, Internet Service Provider, or any parental tracking software may be able to see your activity. You can check if your Chrome browser is managed.

You can choose to block third-party cookies when you open a new incognito window. Learn more about cookies.

53. The linked page also currently provides the following under the heading "How Incognito mode protects your privacy";[62]

What Incognito mode does

- Browsing in Incognito mode means your activity data isn't saved on your device, or to a Google Account you're not signed into.
  - For example, you may use Incognito mode to shop online for a birthday gift for a family member who shares your device. If you don't sign in to your Google account, your shopping activity will not appear in your Chrome browsing activity and won't be saved to your Google Account.
- Each time you close all Incognito windows, Chrome discards any site data and cookies associated with that browsing session.
- Chrome doesn't tell websites, including Google, when you're browsing privately in Incognito mode.

What Incognito mode doesn't do

- Prevent you from telling a website who you are. If you sign in to any website in Incognito mode, that site will know that you're the one browsing and can keep track of your activities from that moment on.
- Prevent your activity or location from being visible to the websites you visit, your school, employer, or your Internet Service provider.
- Prevent the websites you visit from serving ads based on your activity during an Incognito session. After you close all Incognito windows, websites won't be able to serve ads to you based on your signed-out activity during that closed session.

[62] "How Chrome Incognito keeps your browsing private," *Google Chrome Help*, *Google*, available at https://support.google.com/chrome/answer/9845881.

54. The Incognito splash screen also currently contains a toggle to block third-party cookies and further states that "When on, sites can't use cookies that track you across the web. Features on some sites may break."[63] In Chrome versions since Chrome 83, released in May 2020, this toggle is turned on by default.[64]

55. By contrast, the description of Private Browsing Mode on Safari consists of two sentences at the top of the splash screen. The first sentence states that Safari will keep browsing history private for all tabs in this window. The second sentence states that the browser will not remember the "pages you visited, your search history, or your AutoFill information" once a user closes the window. Unlike the Chrome Incognito splash screen, there is no explicit clarification in the Safari screen that other entities on the web may still be able to see the user's activity while in Private Browsing Mode.[65]

56. Further, and as seen below in **Figure 13**, the Firefox Private Browsing Mode splash screen reads "Private window: Firefox clears your search and browsing history when you close all private windows. This doesn't make you anonymous." Below this statement there is a "learn more" link that directs users to a list of four "Common Myths About Browsing," one of which is that "private browsing makes you anonymous on the internet."[66,67]

---

63 Chrome Version 98.

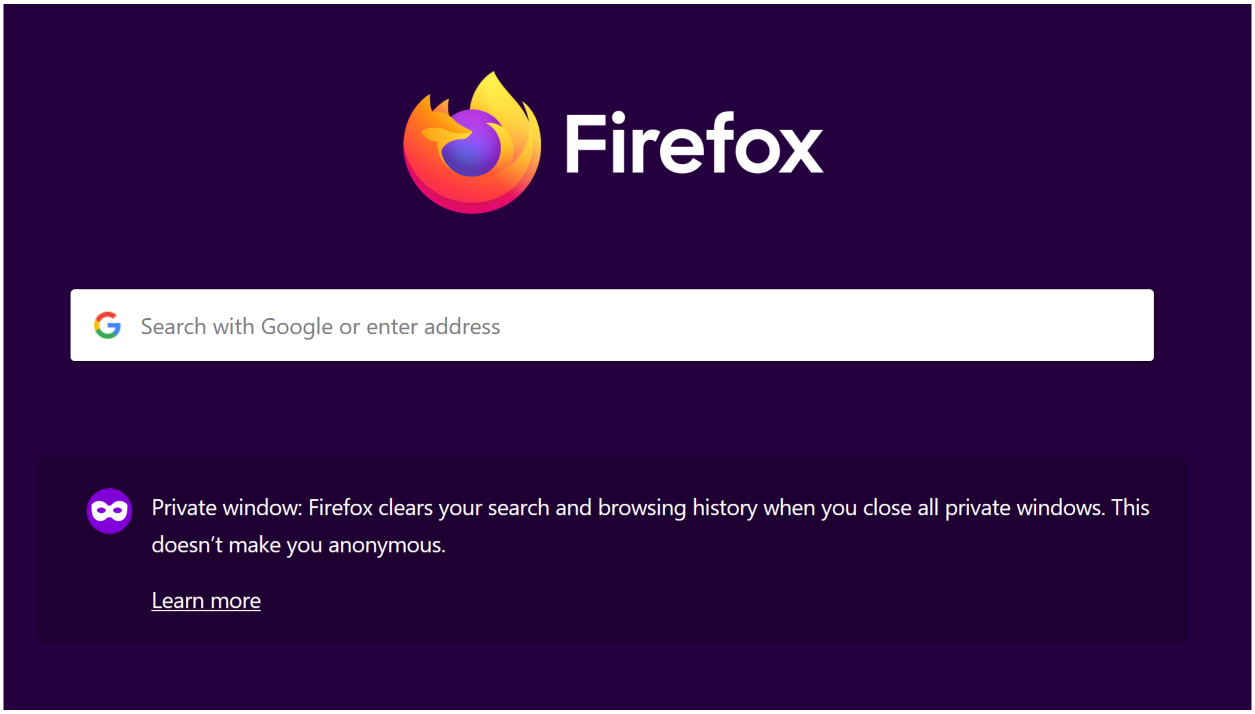
64 Protalinski, Emil, "Chrome 83 arrives with redesigned security settings, third-party cookies blocked in Incognito" *VentureBeat,* May 19, 2020, available at https://venturebeat.com/2020/05/19/google-chrome-83/.

65 Safari Version 14.

66 "Common Myths about Private Browsing," *Support Mozilla*, *Mozilla*, available at https://support.mozilla.org/en-US/kb/common-myths-about-private-browsing?as=u&utm_source=inproduct.

67 Firefox Version 98.

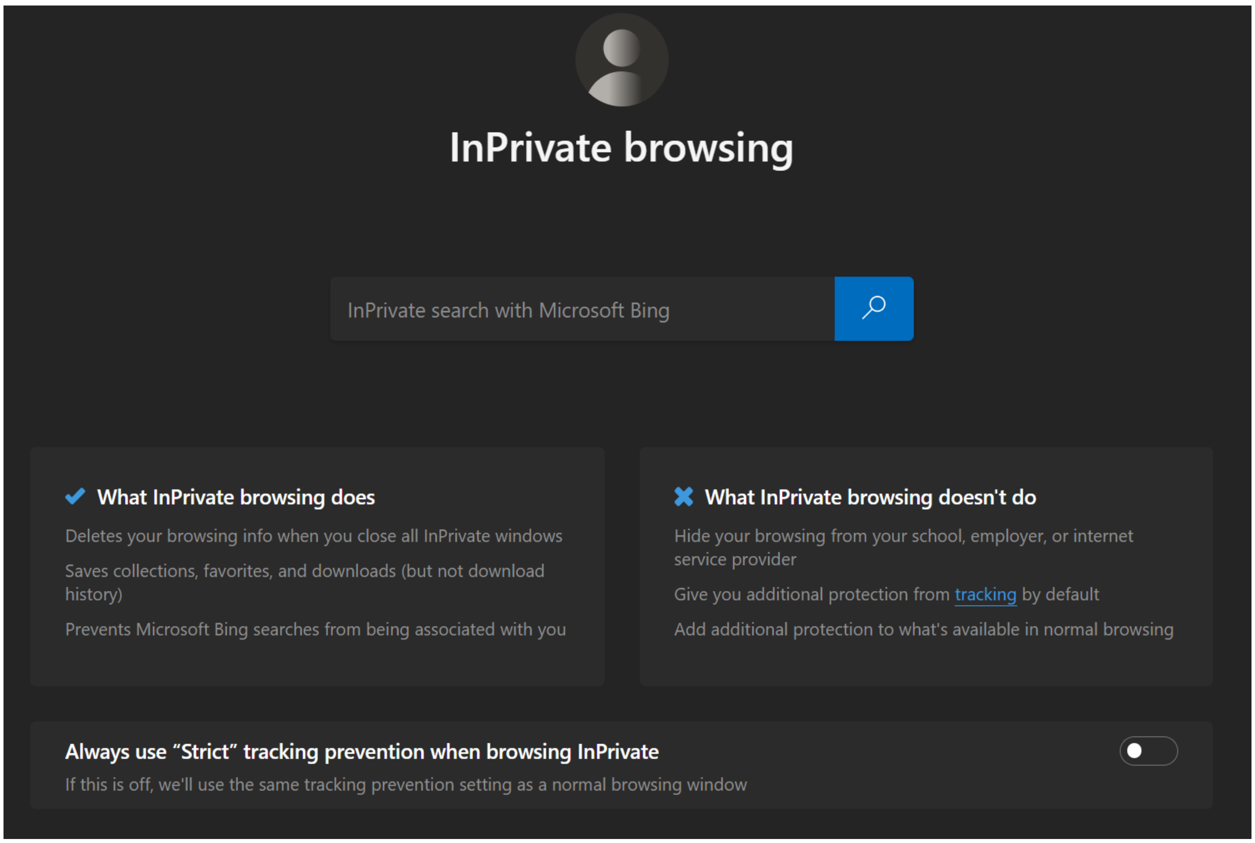
Figure 13
Firefox Private Browsing Mode User Notification Page



57. As seen below in **Figure 14**, Microsoft Edge's Private Browsing Mode screen specifies that it deletes all user browsing information from the browser once all private windows are closed; saves collections, favorites, and downloads; and prevents Microsoft Bing searches from being associated with the user. It also states that Private Browsing Mode does not hide a user's browsing history from their school, employer, or Internet service provider; and does not give them additional protection from tracking by default. There is also a toggle to turn on "Strict" tracking prevention in Private Browsing Mode. Users can also scroll down this page for more details as indicated in below **Figure 14** and shown in **Figure 15**. The additional details contain brief descriptions about what browsing information users can see, the data Edge collects, how Private Browsing Mode with Bing provides protection, and additional settings to control tracking. These

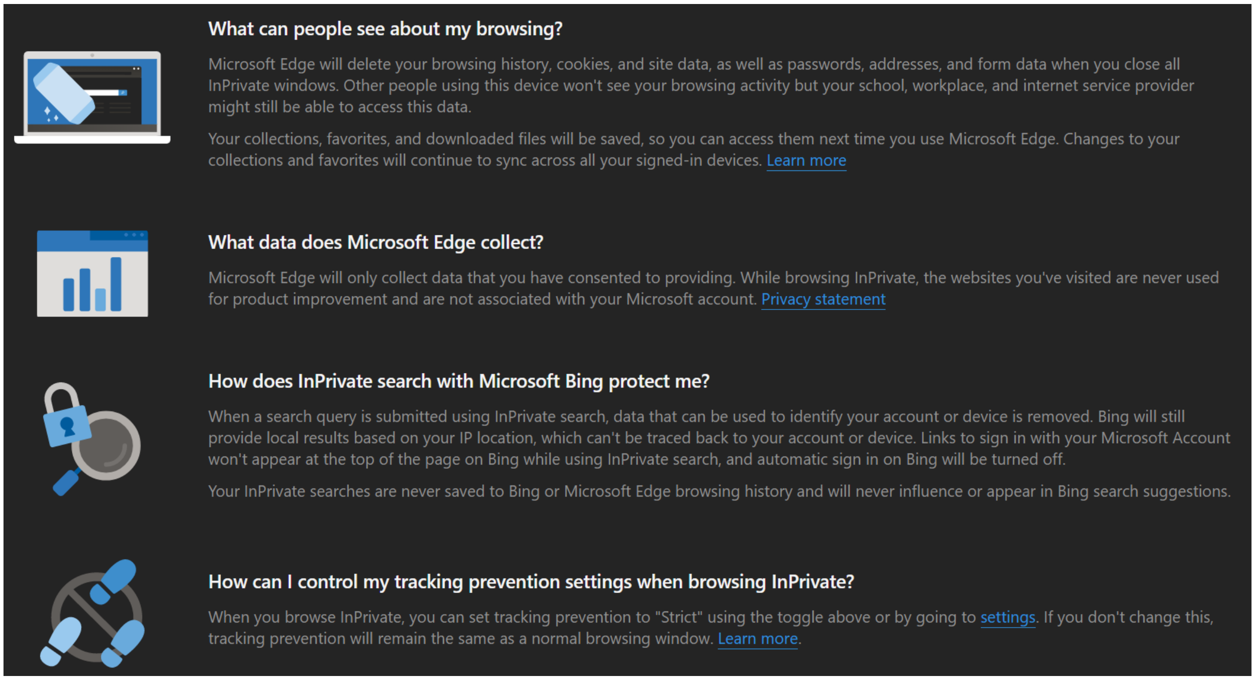
descriptions also provide "learn more" links that direct users to additional articles as well as to a more comprehensive statement.[68]

Figure 14
Edge InPrivate User Notification Page



[68] Microsoft Edge Version 100.

Figure 15
Edge InPrivate Description Page



C. Illustrations and Tests of Private Browsing Mode Behaviors in Chrome

58. As discussed above, although each browser has a different implementation of Private Browsing Mode, there are many common behaviors. In the sections below, I illustrate certain of these common behaviors, focusing on Incognito Mode in the Chrome Browser. I also describe tests conducted in both Regular and Private Browsing Modes with several browser-operating system variations. The detailed methodology of these tests is described in **Appendix D**.

1. Browsing History from a Private Browsing Session Is Not Saved

59. To illustrate how browsing history is not saved in Private Browsing Mode, I accessed certain websites identified in the Complaint in either Regular Mode or Incognito Mode in Chrome. **Figure 16** below lists the browsing mode when I visited the site.

Figure 16
Websites Visited and Browser Modes

Website	**Browser Mode**
#1 *https://www.nytimes.com/*	Regular
#2 *https://www.apartments.com/*	Regular
#3 *https://www.cnn.com/*	Incognito
#4 *https://www.latimes.com/*	Incognito
#5 *https://www.washingtonpost.com/*	Regular

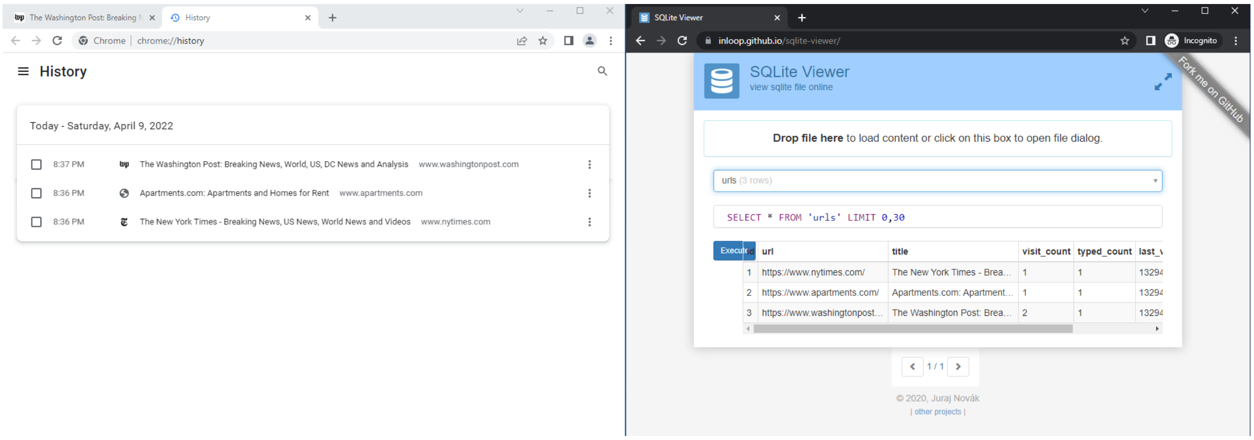
60. Prior to visiting the first website, I cleared my browsing history, cookies, and cache. I then opened a Regular Mode browsing session and accessed websites #1 and then #2. I closed the Regular Mode session and then opened an Incognito Mode session directly by right-clicking the Chrome icon and selecting “New Incognito window”. Then I accessed websites #3 and #4 in the Incognito Mode session. I closed the Incognito Mode session and then opened a new Regular Mode session and accessed website #5. I then opened Chrome’s browsing history and reviewed the websites listed. I also reviewed a file on my device that stores Chrome browsing history locally.[69] Only websites that I visited in Regular Mode were shown in the browser history (displayed in browser and in a file stored locally on the device), and the websites that I visited in Incognito mode were not recorded in the browser history (See **Figure 17** below).[70]

---

[69] File path on my device is "C:\Users\<username>\AppData\Local\Google\Chrome\User Data\Default\History". The location of the file might vary. <username> denotes the name of a user in Windows, and “Default” might be called differently depending on which profile is used in Chrome. The History file is a SQLite database that I opened using *https://inloop.github.io/sqlite-viewer/* and navigated to “urls”.

[70] “How Chrome Incognito keeps your browsing private” *Google Chrome Help*, available at https://support.google.com/chrome/answer/9845881.

Figure 17
Websites Visited and Browser Modes



61. I also visited these websites with Firefox, Edge, and Safari on a desktop device and found consistent results that the websites visited in Private Browsing Mode were not recorded in the web browser's history. Based on my testing, I conclude that browsing activity during a Private Browsing Session is not saved in a web browser's history.[71]

2. Cookies Are Not Shared Between Regular and Private Browsing Modes

62. Cookies are not shared between Regular and Private Browsing Modes when browsing websites. This behavior manifests in two ways. First, the websites visited while in Private Browsing Sessions do not use cookies from prior Regular Mode sessions. Second, any cookies generated during Private Browsing Sessions are discarded when the Private Browsing Session is ended such that subsequent Private Browsing Sessions or Regular Mode sessions cannot access them. In the sections below, I first illustrate these behaviors by showing cookies stored on Chrome

[71] See backup materials for screenshots of browser history tests in Firefox, Edge, and Safari.

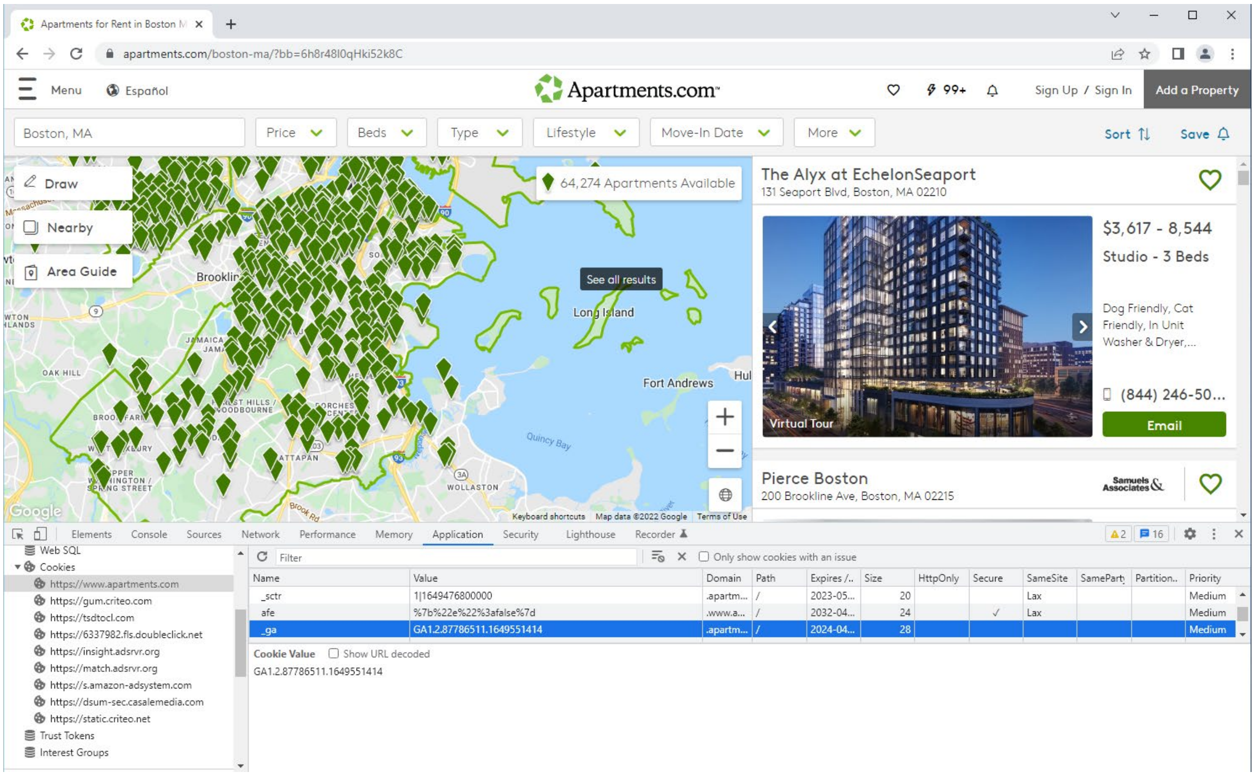
using Chrome's Developer Tools. I then demonstrate how cookies are not shared between Regular and Private Browsing Mode for popular browser and operating system combinations.

a. Pre-Existing Cookie Values are Not Accessible in Private Browsing Mode

63. As discussed above, pre-existing cookies from Regular Mode browsing are not available for Private Browsing Sessions since each session starts with an empty cookie jar. To illustrate how a Private Browsing Session does not have access to pre-existing cookies, I performed visits to Apartments.com. Prior to visiting this website, I cleared my browsing history, cookies, and cache. I opened Chrome in Regular Mode, visited Apartments.com, and searched for apartments in Boston, MA. **Figure 18** below shows a screenshot of my apartment search and the *_ga* cookie value set by apartments.com, as displayed in Chrome's Developer Tools.[72]

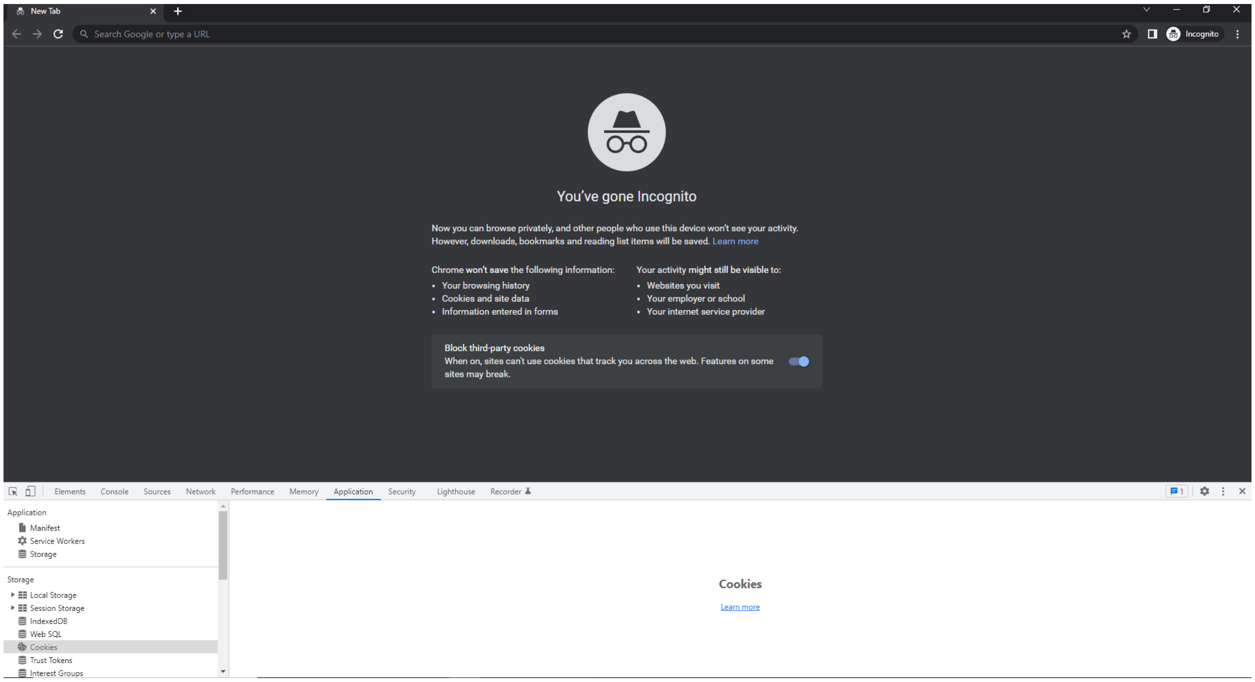
[72] Chrome Developer Tools is a set of web developer tools that are built in directly to the Chrome Browser. Among other features, it allows a user of Chrome to access technical details of Chrome's interaction with websites including cookies that have been set as well as HTTP requests triggered by viewing the website (see Chrome Developer Tools website for more information at *https://developer.chrome.com/docs/devtools/*).

Figure 18
Regular Mode *_ga* Cookie Value



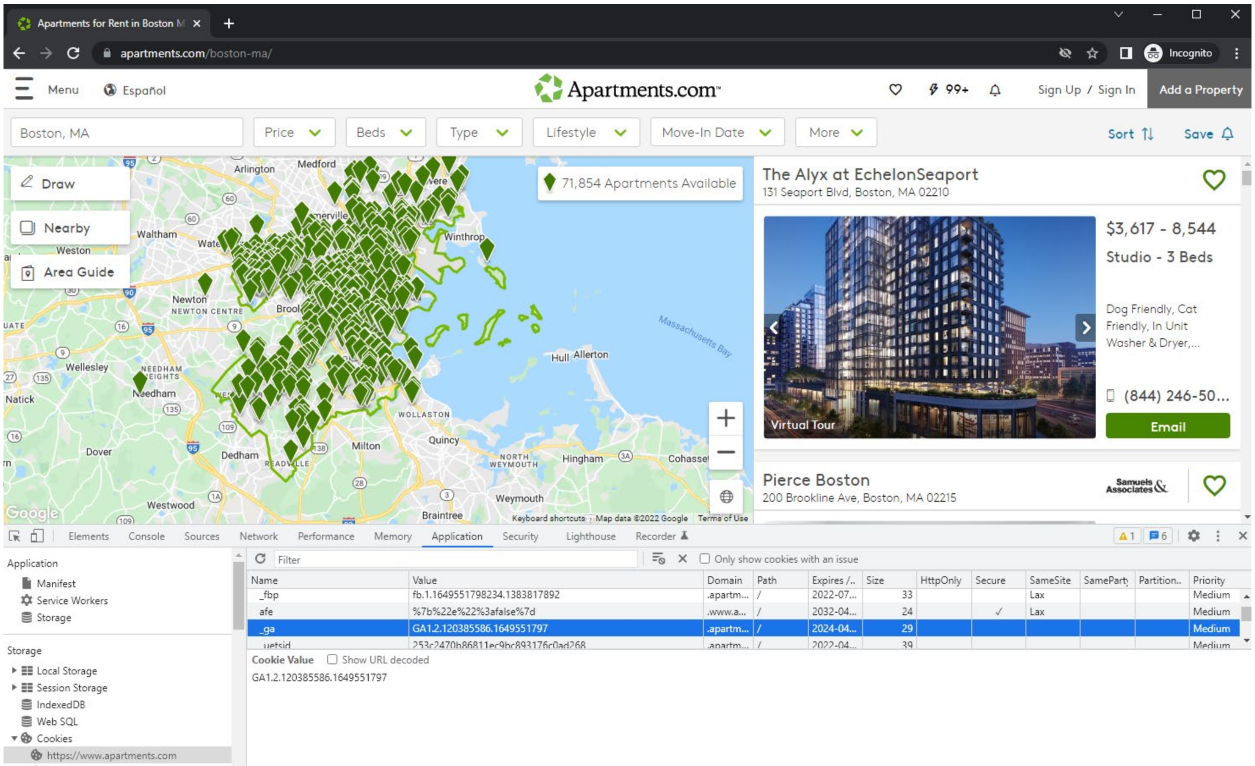
64. I then closed the Regular Mode session and opened an Incognito Mode session directly by right-clicking the Chrome icon and selecting "New Incognito window." In this session I opened Chrome developer tools before visiting any websites. I did not find any cookies stored in the Incognito Mode session (See **Figure 19**).

Figure 19
Empty Cookie Jar in Incognito Mode



65. I then visited *https://apartments.com/* in this Incognito Mode session, and observed cookies placed on my browser. The *_ga* cookie value set in Incognito Mode was different from the *_ga* cookie value set in Regular Mode. As shown in **Figure 18** above, the *_ga* cookie value in the Regular Mode session was 'GA1.2.87786511.1649551414', and as shown in **Figure 20** below, the *_ga* cookie value in the Incognito Mode browsing session was 'GA1.2.120385586.1649551797.' This illustrates that Incognito Mode browsing uses a cookie jar that is separate from the Regular Mode cookie jar.

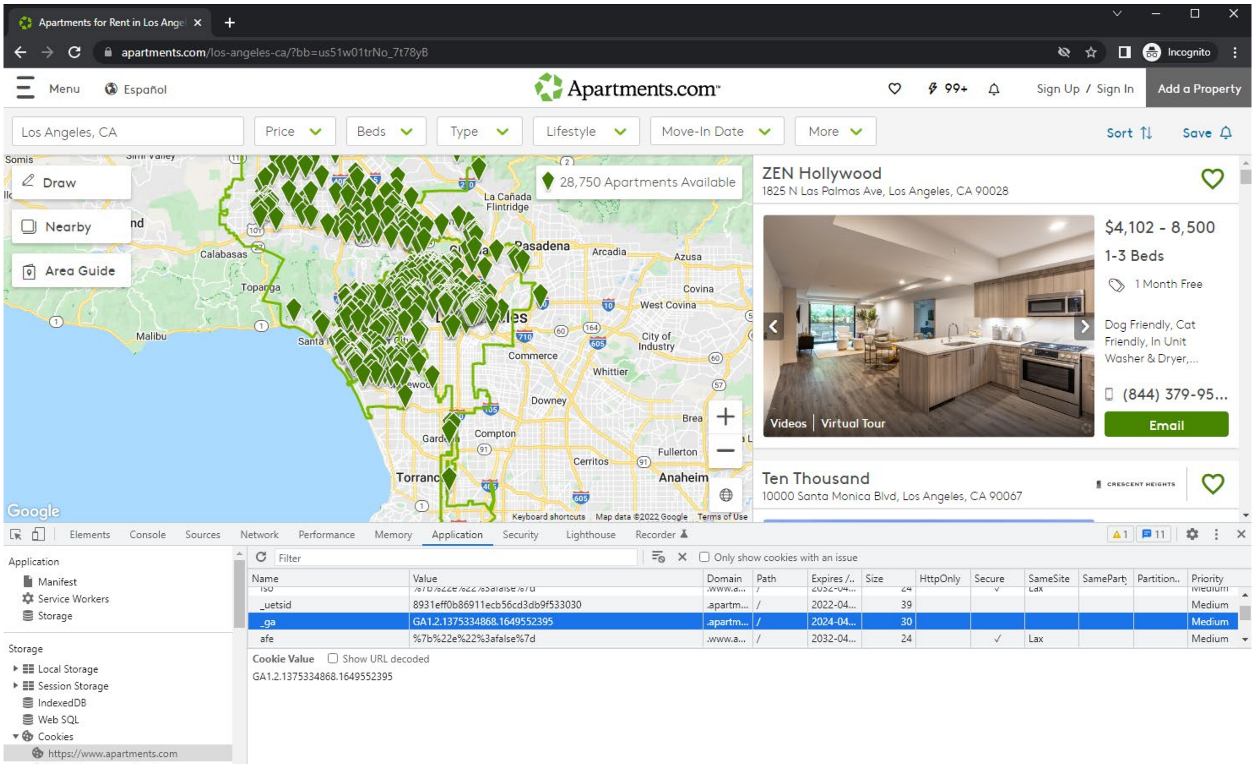
Figure 20
Apartment Search in Incognito Mode



b. *Cookies Are Discarded after Incognito Mode Browsing Sessions*

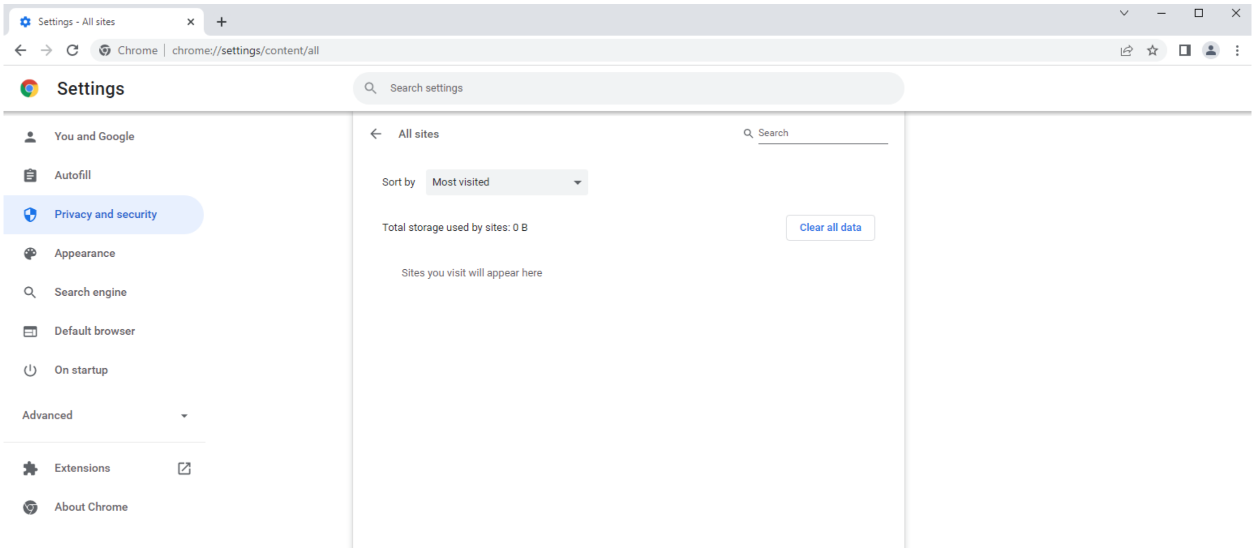
66. Cookies and site data stored by the browser during a Private Browsing Session are discarded and not available to subsequent browsing sessions, whether in Private Browsing Mode or Regular Mode. To illustrate this behavior, I performed a second series of website visits to Apartments.com. As a first step, I cleared my browsing history, cookies, and cache. I then visited Apartments.com in Incognito Mode in Chrome and searched for apartments in Los Angeles, CA. Apartments.com placed several cookies on my browser. **Figure 21** below shows a screenshot of my browser with the Apartments.com cookies stored in the Incognito Mode session shown via Chrome's Developer Tools. We can see the *_ga* cookie value set to "GA1.2.1375334868.1649552395."

Figure 21
Apartments.com Cookies on the Browser in Incognito Mode



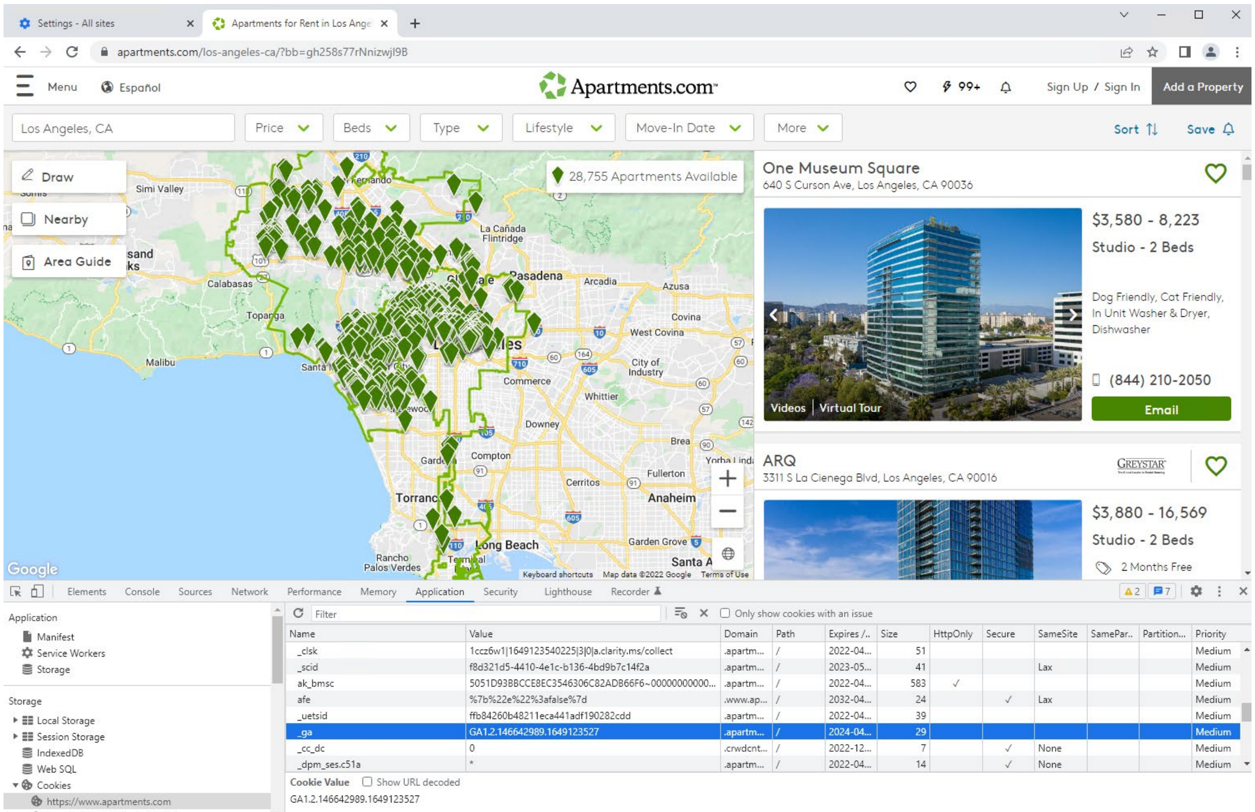
67. I then closed the Incognito Mode session and in Regular Mode opened my browser settings to see what websites had stored cookies on the device. I did this by navigating to the "See all site data and permissions" setting under "Privacy and Security" in Chrome settings. As shown in **Figure 22**, my browser did not have any saved cookies at that point.

Figure 22
Site Data in Chrome Settings



68. I then navigated to Apartments.com in Regular Mode, searched for apartments in Los Angeles, and found that the *_ga* cookie value was different than the value in the Incognito Mode Session (**Figure 21**), as I would expect since the cookies set in Incognito Mode were automatically removed from the device once I closed the Incognito Mode session. More precisely, the *_ga* cookie value in the Regular Mode session was 'GA1.2.26270693.1649552739,' which differs from the *_ga* cookie value of 'GA1.2.1375334868.1649552395' set in the Incognito Mode browsing session (See **Figure 23**). This illustrates that cookies and site data obtained during a Private Browsing Session are discarded after the session has ended.

Figure 23
Apartments.com in Regular Mode with a Different _ga Cookie Value



c. *Testing Confirmed that Private Browsing Mode Restricted the Sharing of Certain Types of Data Across Browsing Sessions on Popular Browsers*

69. To evaluate whether cookies are shared between Regular and Private Browsing Sessions for popular browser and operating system combination, I conducted a series of tests on five websites identified in the complaint: *https://www.nyimes.com/*, *https://apartments.com/*, *https://www.cnn.com/*, *https://www.latimes.com/*, *https://www.washingtonpost.com/*. I then summarized the results of these tests in Exhibits 1.1-1.20.[73] For all testing variations, which

[73] I also tested Chrome Version 81 before third-party cookies were blocked by default. These results are included in **Appendix E**.

include various websites, browsers, and operating systems described in **Appendix D**, I observed that cookie values are often the same across Regular Mode sessions, which indicates that Regular Mode sessions share cookies and cookie values.[74] For example, when I visited *https://www.apartments.com/* in Chrome on Windows, the *_ga* cookie value was the same across all three Regular Mode sessions.

70. While cookie values are often the same across Regular Mode sessions, I observe that cookie values stored from prior Regular Mode sessions are not used in the Private Browsing Sessions; instead, the Private Browsing Mode cookies have different values. In addition, cookie values are also not shared between consecutive Private Browsing Sessions, indicating that when a new Private Browsing Session is initiated, any cookies set in that session would contain new values that are not carried over from prior Regular Mode or Private Browsing Mode sessions. Further, cookie values set in Private Browsing Mode will not be carried over to subsequent Regular or Private Browsing Mode sessions. For example, for *https://www.apartments.com/* in Chrome on Windows, the *_ga* cookie values are not only different when compared between Regular Mode and Private Browsing Mode but are also different when compared between two Private Browsing Sessions.[75]

---

[74] There are some instances when cookie values are transmitted in one session but not another. For example, in my test of *https://www.nytimes.com/*, I observed CMID values being sent to Google-associated domains for Regular Mode (Initial Session) but not Regular Mode (Session 1). These instances do not indicate that cookie values from Regular Mode and Private Browsing Sessions are shared and therefore do not change my conclusions.

[75] In some limited instances, I observed the same cookie values across Regular Mode and Private Browsing Sessions. However, I have seen no indication that this is a result of the cookie values having been shared between the two sessions. To the contrary, in my opinion these are examples of websites separately setting the same cookie value in different sessions, for a purpose other than identification of a user or their device. For example, I observed general settings-related cookies such as a *DSID* (value "NO_DATA"). Additionally,

71. Based on my testing, I conclude that cookies are not shared between Regular Mode and Private Browsing Mode sessions. The cookies that are set during a Private Browsing Session are also discarded following the end of the Private Browsing Session.

3. Private Browsing Sessions Will Not Be Logged into Any Accounts or Sites

72. As described above, since Private Browsing Sessions do not access cookies and site data of Regular Mode Sessions, when a user enters Private Browsing Mode, they will not be logged into any sites or their Google Account when browsing websites. To illustrate this feature of Incognito Mode in Chrome, I opened a Regular Mode Session and logged into *drive.google.com* with a test account (See **Figure 24**). I then opened an Incognito Mode browsing session and accessed *drive.google.com*, while the Regular Mode browsing session was still open and the test account was logged into *drive.google.com*. As shown in **Figure 25**, in Incognito mode, I was not logged into Google using the test account and had no access to any files from my Google Test account.

---

https://www.washingtonpost.com/ uses the Google Analytics *_gaexp* cookie for experiments across its website. The *_gaexp* cookie is used when the website is running experiments with variations of its site design using Google Analytics, and I have seen no evidence indicating that it is or can be used for any purpose other than identification of these experiments. I provide a more extensive discussion of other, similar examples of cookie value transmissions in **Appendix F**.

Figure 24
Regular Mode Google Drive Logged in with a Test Account

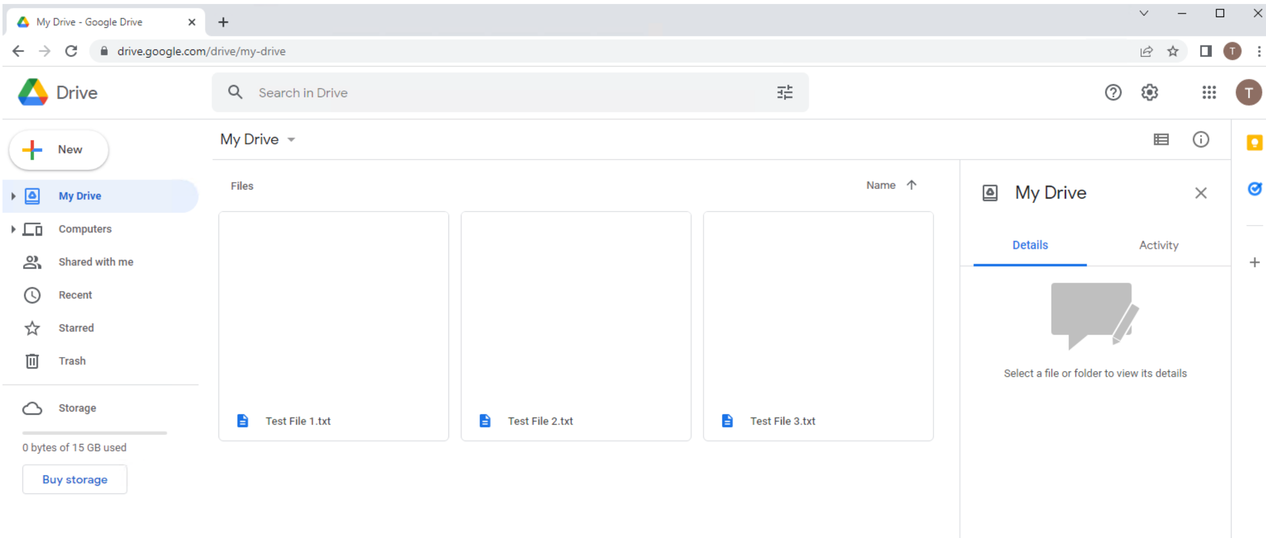
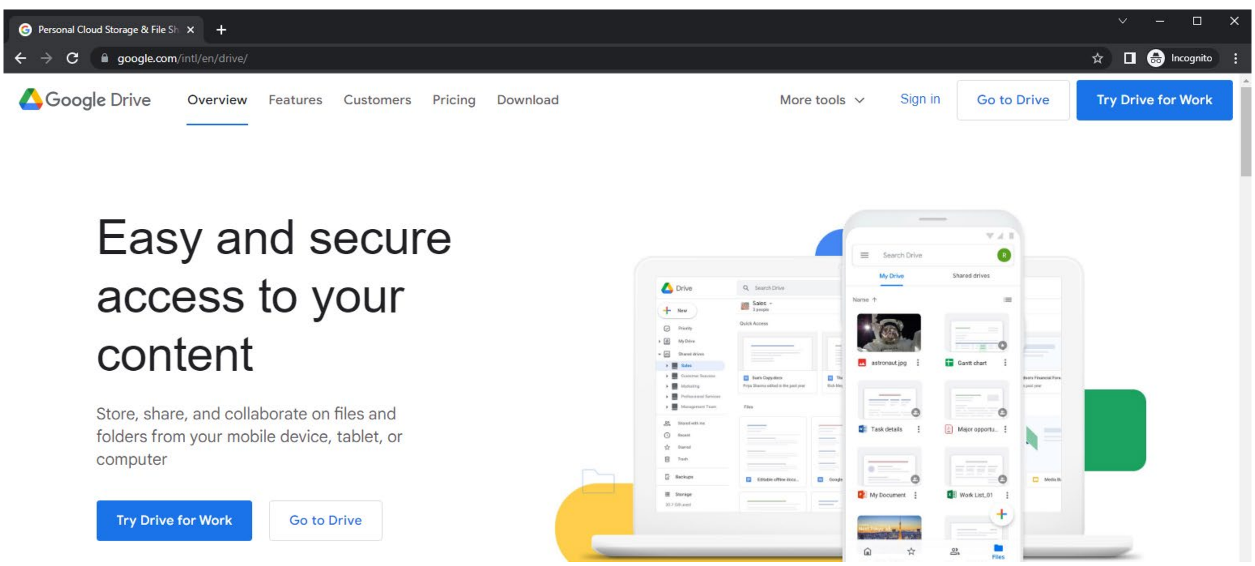


Figure 25
Incognito Mode Automatically Logged Out of Google Drive



73. I also replicated these tests with Firefox, Edge, and Safari on a desktop device and found consistent results. Based on my testing, I conclude that the user will not be logged into any accounts upon initiation of a Private Browsing Session.[76]

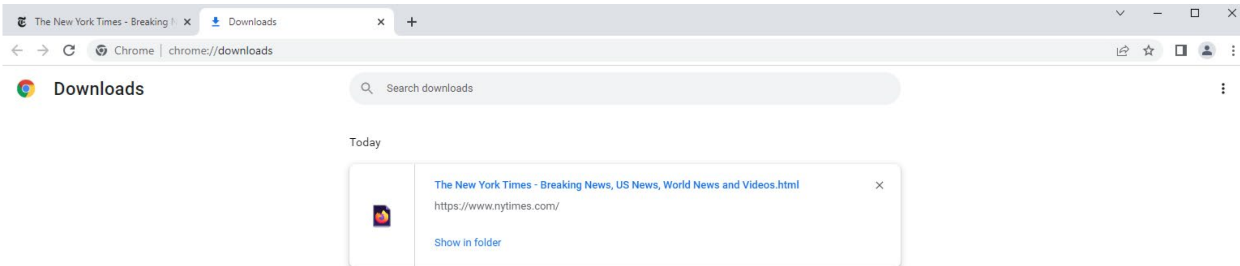
4. Downloaded Files Do Not Appear in Download Lists

74. When in Private Browsing Mode, browsers typically do not keep records of files downloaded while browsing. However, the files are still saved to a user's device, even after exiting Private Browsing Mode.[77] To illustrate this behavior, I downloaded webpages both in Regular and in Incognito Mode using Chrome. First, I cleared my browsing history, cookies, and cache. I then navigated to the *https://www.nytimes.com/* home page and downloaded a copy of that webpage to my local device. Then, I opened an Incognito Mode session and accessed the *https://www.washingtonpost.com/* home page and downloaded a copy of that webpage to my local device, while the Regular Mode Session was still open. I reviewed the list of downloaded files Chrome stores through Chrome's "Customize and Control Chrome" menu and selecting "Downloads" (also accessible by pressing Control + J, or navigating to *chrome://downloads/*). When I accessed the list of downloads, only the download from the Regular Mode Session was listed, not the download from Incognito Mode (See **Figure 26**).

[76] See backup materials for screenshots of login tests in Firefox, Edge, and Safari.

[77] "How private browsing works in Chrome," *Google Chrome Help*, *Google*, available at https://support.google.com/chrome/answer/7440301?hl=en.

Figure 26
Incognito Mode Download Not listed

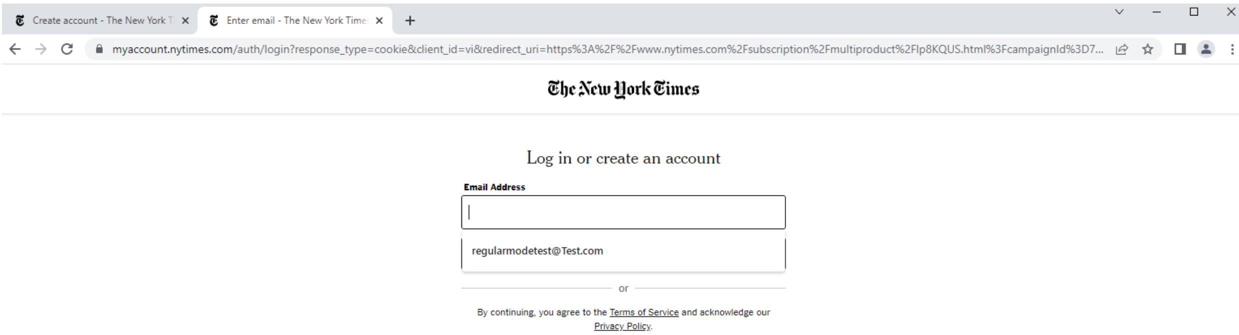


75. Consistent with the descriptions of how Incognito Mode operates, only the file downloaded in a Regular Mode Session is listed under Chrome downloads, though both files still appear in the "Downloads" folder of the device (outside of Chrome).

5. *Autofill Web Forms from Private Browsing Mode Are Not Available in Regular Mode*

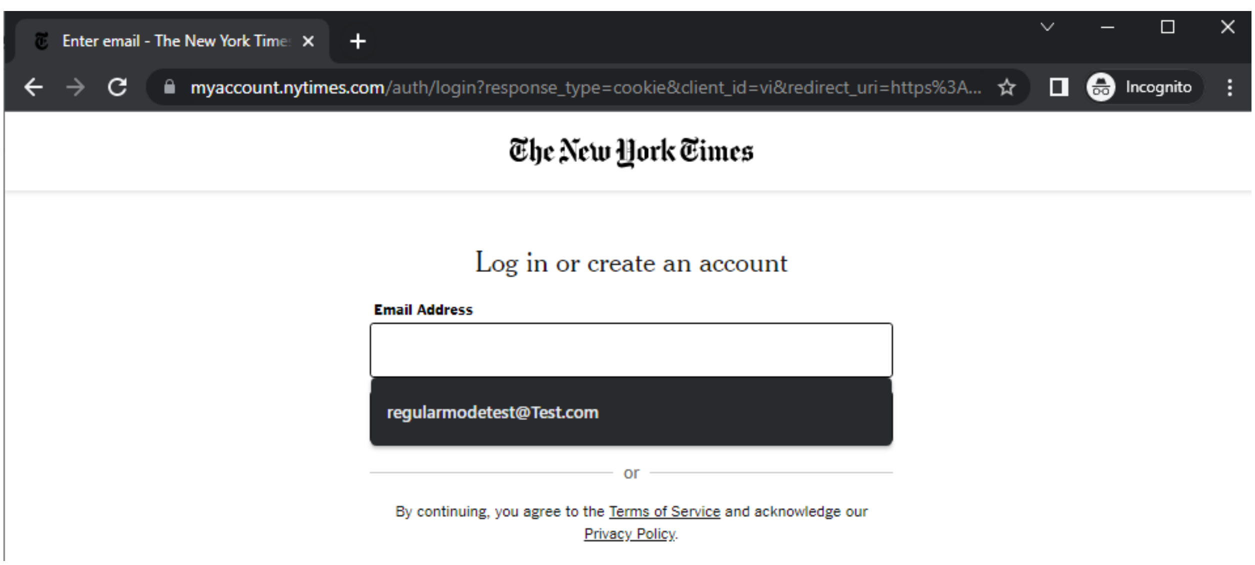
76. Browsers have features to fill out forms automatically with information that has already been entered into forms on webpages, such as login or address information. When in Private Browsing Mode, browsers typically do not keep the information being entered in forms, so any new information entered into forms while in Private Browsing Mode will not be available to users in Regular Mode. To illustrate this behavior, I navigated to https://www.nytimes.com in Regular Mode and attempted to create a New York Times account with the username "regularmodetest@Test.com" and a password of "RegularMode." After submitting the form, Chrome recorded my input for the email address to autofill the field the next time I attempted to log into the New York Times website. **Figure 27** below shows Chrome displaying the autofilled email address as an option to fill in the login form.

Figure 27
Autofill Option



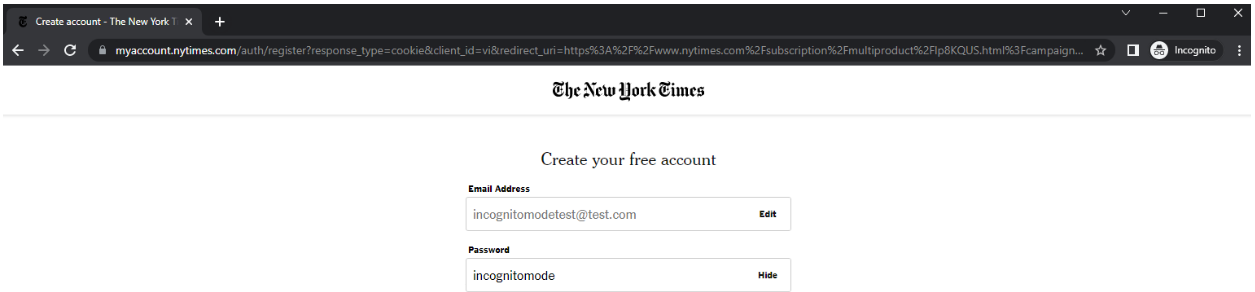
77. Next, I opened Chrome in Incognito Mode, navigated to the New York Times website login page, and clicked in the Email Address field. As indicated by **Figure 28** below, the email address "regularmodetest@Test.com" was presented as an option.

Figure 28
Regular Mode Form Information Available in Incognito



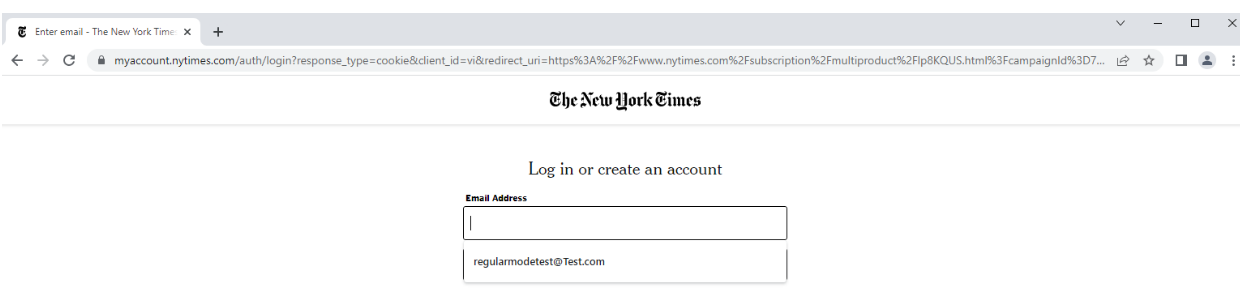
78. I then repeated the steps described above to log into the New York Times website but with the username "incognitomodetest@test.com" and a password of "incognitomode" (see **Figure 29**).

Figure 29
Nytimes.com Log in Page Incognito Mode



79. After submitting the form, I closed both the Incognito Mode and Regular Mode sessions. I then opened a new Regular Mode session and navigated to the New York Times login page. When I clicked into the email field of the form, only the Regular Mode email address was suggested, not the Incognito Mode email address (See **Figure 30**). Based on my testing, I have concluded that when forms are filled out in Chrome Incognito Mode, the form information will not be available in Regular Mode. However, when forms are filled out in Regular Mode, the form information will be available during Incognito Mode.

Figure 30
Nytimes.com Log in Page Regular Mode



D. Conclusions Regarding Private Browsing Mode

80. Based on my experience, analysis of documents, and testing, in my opinion Private Browsing Modes work as described by Google and other companies by concealing users' browsing activity from other people who may use the same device, and by ensuring that cookie values generated during the Private Browsing Sessions cannot be used to provide a link to the user's browsing activity in Regular Mode.

81. Private Browsing Modes conceal users' browsing activity from other people who may use the same device by discarding any browsing history or cookies that were stored by the browser during the Private Browsing Session, so that data is not accessible in subsequent sessions. My testing confirmed this. For example, I tested the Chrome browser by visiting websites in Regular and Incognito mode, and observed that in subsequent Regular Mode sessions only the websites that I visited in Regular Mode were shown in the browser history—the websites I visited in Incognito mode were not recorded in the browser history.

82. Private Browsing Modes also ensure that the cookie values generated during the Private Browsing Session cannot be used to provide a link to the user or her device after that session is closed (unless the user explicitly enables a website to make this association by signing into the website during the Private Browsing Session, or enables Google to do so by signing into their Google account during the Private Browsing Session). Private Browsing Modes accomplish this by starting each Private Browsing Session with a "clean" browser (the user is not logged into her accounts and browsing history or cookies from prior sessions are not accessible) and discarding data associated with the user's browsing activity when the session is closed. My testing also confirmed these aspects of Private Browsing Mode. I have confirmed that Private Browsing Modes (1) prevent browsing history from being saved on the device, (2) prevent the user and browser in

Private Browsing Sessions from accessing browsing history and cookies from Regular Mode sessions; and (3) discard cookies placed on the browser during the Private Browsing Session when that session is closed.

83. Because Private Browsing Modes handle cookies and other browsing data in this manner, it is my opinion that, the cookie value transmissions to Google-associated domains—when a user who is not logged into a Google account and uses Private Browsing Mode to visit a third-party website containing "Google tracking or advertising code"—constitute "orphaned" islands of data that cannot be used to provide a link to a user's Google Account or other Private Browsing Sessions. In my opinion, these cookie values cannot be used to link the Private Browsing Mode activities to a user or her device after that Private Browsing Session is closed, which would prevent Google from using the cookie values to create a "cradle-to-grave profile of users," as Plaintiffs allege.

84. I have also concluded that Private Browsing Modes are neither designed to nor do provide users complete anonymity or invisibility as they browse the web. Even in Private Browsing Mode, web browsing necessarily involves transmission of messages from a user's browser, and those messages must conform to protocols and standards, such as the HTTP protocol, and include information such as IP addresses. Private Browsing Modes are also not designed to block all communications between the browser and websites or third-party web-services that the website owner has incorporated in their website.

V. GOOGLE SERVICES USED BY THIRD PARTY WEBSITES AND ASSOCIATED DATA TRANSMISSIONS

85. As described above in my Summary of Plaintiffs' Allegations, I understand Plaintiffs allege that Google improperly intercepted, received, or collected data of Chrome and

non-Chrome browser users who have a Google account and accessed a non-Google website containing "Google tracking or advertising code" while in Private Browsing Mode and not logged into their Google account.[78] In this section, I provide a summary of examples of "Google tracking or advertising code" that I understand are at issue in this case and the Google products with which that code is associated. I also provide my opinion as to whether Private Browsing Modes have an impact on whether information is sent to Google when a user visits a website that uses the "Google tracking or advertising code." I then describe various settings, browser extensions, and other factors that do have an impact on the extent to which information is sent to Google when a user visits a website that uses the "Google tracking or advertising code."

A. Google Analytics

86. Google Analytics is a product that customers can use to collect, configure, process, and report on user interactions with their online content.[79] Thus, Google Analytics helps customers understand how visitors interact with their websites and gain insight into metrics such as user engagement and retention. Visibility into such metrics is important for developing user-friendly websites.[80] For example, by understanding visitors' language settings (in the aggregate), a Google

---

78 Complaint, ¶ 192.

79 "Learn about Google Analytics," *Google Analytics*, *Google*, available at https://developers.google.com/analytics/devguides/platform. Google Analytics customers (i.e., website operators) are migrating from Universal Analytics to Google Analytics 4, which is intended to fully replace the preceding service by July 1, 2023. My description is applicable to both versions of the service unless stated otherwise. *See* "Universal Analytics will be going away," *Analytics Help*, *Google*, available at https://support.google.com/analytics/answer/11583528?hl=en.

80 *See also,* Garett, Renee et al., "A Literature Review: Website Design and User Engagement," *Online journal of communication and media technologies*, Vol. 6,3 (2016): 1-14, available at https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4974011/; Rodden, Kerry et al., "Measuring the User Experience on a Large Scale: User-Centered Metrics for Web

Analytics customer might realize that a large percentage of visitors prefer a language that is not currently offered on the customer's website, leading the customer to create an additional website version that supports this language.

87. Google Analytics is not the only product on the market that provides web traffic analysis services. Other free and paid services that similarly allow website developers to measure and analyze traffic to their website include Hotjar,[81] Mixpanel,[82] Matomo,[83] Piwik PRO,[84] Adobe Analytics,[85] and many others. Most of these services are "tag-based," requiring the website developer to include code in their website to transmit data to a third-party server for analysis and reporting.[86]

88. Customers use the Google Analytics product by creating an Analytics account and setting up the product on their website. To set up Google Analytics on their website, the customer incorporates "tags," which are short snippets of JavaScript code, into the HTML source code for their website. The tag is highly customizable to satisfy the customer's analytics and privacy needs, and Google offers a tag management system called Google Tag Manager that allows Google

---

Applications," *ACM Press*, April 2010, available at https://static.googleusercontent.com/media/research.google.com/en//pubs/archive/36299.pdf.

81 "Understand how users behave on your site, what they need, and how they feel, fast," *Hotjar*, available at https://www.hotjar.com/.

82 "Build Better Products," *Mixpanel*, available at https://mixpanel.com/.

83 "Google Analytics alternative that protects your data and your customers' privacy," *Matomo*, available at https://matomo.org/.

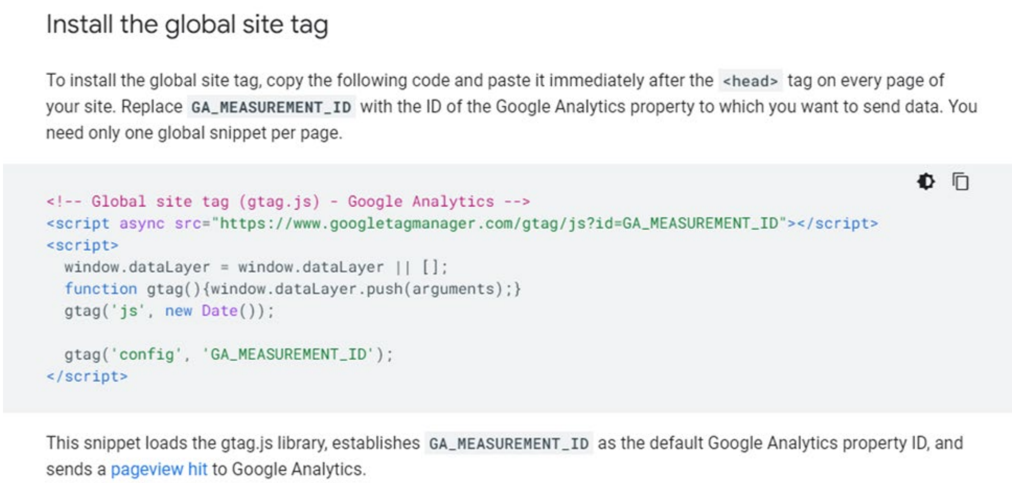
84 "Analyze the customer journey across websites and apps," *PIWIK PRO,* available at https://piwik.pro/.

85 "Analytics anywhere in the customer journey," *Adobe Analytics*, *Adobe*, available at https://www.adobe.com/analytics/adobe-analytics.html.

86 "Tag," *At Internet*, available at https://www.atinternet.com/en/glossary/tag-3/.

Analytics customers to configure and deploy tags on their website via a web-based user interface.[87] Below is an illustration of a “gtag.js” tag generated by Google Analytics:[88,89]

Figure 31
Installation of Google Analytics Tag



Install the global site tag

To install the global site tag, copy the following code and paste it immediately after the `<head>` tag on every page of your site. Replace `GA_MEASUREMENT_ID` with the ID of the Google Analytics property to which you want to send data. You need only one global snippet per page.

```
<!-- Global site tag (gtag.js) - Google Analytics -->
<script async src="https://www.googletagmanager.com/gtag/js?id=GA_MEASUREMENT_ID"></script>
<script>
  window.dataLayer = window.dataLayer || [];
  function gtag(){window.dataLayer.push(arguments);}
  gtag('js', new Date());

  gtag('config', 'GA_MEASUREMENT_ID');
</script>
```

This snippet loads the gtag.js library, establishes `GA_MEASUREMENT_ID` as the default Google Analytics property ID, and sends a pageview hit to Google Analytics.

89. As described in Google’s public developer documentation, the Google Analytics tag can be configured by the customer to measure specific user interactions with their website and change the types of data that can be sent to Google Analytics.[90] However, the Google Analytics

87 “Tag Manager overview,” *Tag Manager Help*, *Google*, available at https://support.google.com/tagmanager/answer/6102821?hl=en.

88 “About Google Tag Manager,” *Tag Manager*, *Google*, available at https://developers.google.com/tag-platform/tag-manager; “Add gtag.js to your site,” *Google Analytics*, *Google*, available at https://developers.google.com/analytics/devguides/collection/gtagjs.

89 I understand that gtag.js, the tag used for Universal Analytics and Google Analytics 4, superseded a previous tag called analytics.js. *See* “Migrate from analytics.js to gtag.js (Universal Analytics),” *Google Analytics*, *Google*, available at https://developers.google.com/analytics/devguides/migration/ua/analyticsjs-to-gtagjs.

90 “Cookies and user identification with gtag.js,” *Google Analytics*, *Google*, available at https://developers.google.com/analytics/devguides/collection/gtagjs/cookies-user-id; “Google

Terms of Service state that "[y]ou will not and will not assist or permit any third party to, pass information to Google that Google could use or recognize as personally identifiable information."[91]

90. According to Google's public documentation, when a user of any browser visits a website that uses Google Analytics, the following data may be sent to Google Analytics:[92]

- First-party cookie values. This is explicitly enabled by the website which sets first-party cookies and embeds Google Analytics tags in the website source code;
- Data about a user's browser and devices. This is the same information contained in HTTP messages that any other website would receive when a user attempts to access it;
- IP address;
- Metrics related to user activity on the first-party website.

91. Google Analytics uses cookies to provide services to customers. When user visits a website that includes the Google Analytics tag, the tag will attempt to set the following first-party HTTP cookies on the user's browser: "_ga", "_gid", "_ga_<container-id>," and "_gac_gb_<container-id>" for Google Analytics 4, and "_ga", "_gid", "_gat", "AMP_TOKEN" ,

Analytics 4 tags," *Tag Manager Help*, *Google*, available at https://support.google.com/tagmanager/answer/9442095.

[91] "Google Analytics Terms of Service," *Google Marketing Platform*, available at https://marketingplatform.google.com/about/analytics/terms/us/.

[92] "Safeguarding your data," *Analytics Help, Google*, available at https://support.google.com/analytics/answer/6004245.

"_gac_<property-id>" for Universal Analytics.[93] The Google Analytics customer can change various field settings for these cookies, such as cookie domain, when the cookie expires, or the cookie name. This is described, for example, in the excerpts of Google's public documentation shown in the following figure:[94]

Figure 32
Configuring Cookie Field Settings for Google Analytics

Configuring cookie field settings

The following table shows the default cookie field values used by analytics.js:

Field Name	Value Type	Default value
`cookieName`	text	`_ga`
`cookieDomain`	text	The result of the following JavaScript expression: `document.location.hostname`
`cookieExpires`	integer	`63072000` (two years, in seconds)
`cookieUpdate`	boolean	`true`
`cookieFlags`	text	

To modify any of these values, you can specify them in the `fieldObject` you pass the `create` command. For example:

```
ga('create', 'UA-XXXXX-Y', {
  'cookieName': 'gaCookie',
  'cookieDomain': 'blog.example.co.uk',
  'cookieExpires': 60 * 60 * 24 * 28  // Time in seconds.
  'cookieUpdate': 'false',
  'cookieFlags': 'SameSite=None; Secure',
});
```

93 "Google Analytics Cookie Usage on Websites," *Google Analytics*, *Google*, available at https://developers.google.com/analytics/devguides/collection/gtagjs/cookie-usage.

94 "Cookies and User Identification," *Google Analytics, Google*, available at https://developers.google.com/analytics/devguides/collection/analyticsjs/cookies-user-id.

92. A Google Analytics customer can also optionally create a User-ID to identify website visitors that have signed into their website. How and whether visitors are assigned a User-ID is a choice of the customer, who must actively enable this functionality in their Google Analytics account.[95] Google Analytics does not set or manage the User-ID, and Google prohibits Google Analytics customers from using data that could be used to personally identify an individual, or data that permanently identifies a particular device.[96]

93. Google Analytics customers that have a Google Ads account may also link those accounts to enable Google Analytics advertising reporting tools.[97] As Google's public documentation explains, these features are governed by the Google Analytics customers' and users' Ads settings and policy requirements of Google Analytics Advertising Features.[98] At the

[95] "About the User-ID feature," *Analytics Help, Google,* available at https://support.google.com/analytics/answer/3123662#zippy=%2Cin-this-article; "[GA4] Measure activity across platforms," *Analytics Help, Google,* available at https://support.google.com/analytics/answer/9213390?hl=en.

[96] "User-ID limits," *Analytics Help, Google,* available at https://support.google.com/analytics/answer/3123668; "Measurement Protocol, SDK, and User ID Feature Policy," *Google Analytics*, *Google*, available at https://developers.google.com/analytics/devguides/collection/protocol/policy; "[GA4] Measure activity across platforms," *Analytics Help, Google,* available at https://support.google.com/analytics/answer/9213390?hl=en; "Measurement Protocol, SDK, and User ID Feature Policy," *Google Analytics*, *Google*, available at https://developers.google.com/analytics/devguides/collection/protocol/ga4/policy.

[97] "About Advertising Features," *Analytics Help*, *Google*, available at https://support.google.com/analytics/answer/3450482; "Enable Remarketing and Advertising Reporting Features in Analytics," *Analytics Help, Google,* available at https://support.google.com/analytics/answer/2444872; "Activate Google signals," *Analytics Help, Google,* available at https://support.google.com/analytics/answer/7532985. "[GA4] Link Google Ads and Analytics," *Analytics Help, Google,* available at https://support.google.com/analytics/answer/9379420?hl=en.

[98] "Policy requirements for Google Analytics Advertising Features," *Analytics Help, Google,* available at https://support.google.com/analytics/answer/2700409; "[GA4] Activate Google signals for Google Analytics 4 properties," *Analytics Help*, *Google*, available at https://support.google.com/analytics/answer/9445345?hl=en; "Google Analytics 4 SDK, and

customer's choice, Advertising Features enable Google Analytics to collect data via Google advertising cookies in addition to Google Analytics cookies. As shown in **Figure 33** below, if a customer enables these Advertising Features, Google requires the customer to notify its visitors accordingly, and encourages customers to point users to the Google Analytics opt-out add-on, which is available on Chrome, Firefox, Edge, and Safari.[99]

Figure 33
Google Analytics Advertising Privacy Features

If you've enabled any Google Analytics Advertising features, you are required to notify your visitors by disclosing the following information in your privacy policy:

- The Google Analytics Advertising Features you've implemented.
- How you and third-party vendors use first-party cookies (such as the Google Analytics cookie) or other first-party identifiers, and third-party cookies (such as Google advertising cookies) or other third-party identifiers together.
- How visitors can opt-out of the Google Analytics Advertising Features you use, including through Ads Settings, Ad Settings for mobile apps, or any other available means (for example, the NAI's consumer opt-out).

We also encourage you to point users to Google Analytics' currently available opt-outs for the web.

1. Data Transmissions to Google Analytics Are Impacted by the Choices of Website Developers

94. As described above, Google Analytics customers have control over whether Google collects and uses data relating to users' interactions with the customer's website. For example,

User ID Feature Policy," *Analytics Help*, *Google*, available at https://developers.google.com/analytics/devguides/collection/ga4/policy.

[99] "Policy requirements for Google Analytics Advertising Features," *Analytics Help, Google,* available at https://support.google.com/analytics/answer/2700409; "Google Analytics Opt-out Browser Add-on," *Google Tools, Google*, available at https://tools.google.com/dlpage/gaoptout/; "Google Analytics 4 SDK, and User ID Feature Policy," *Analytics Help*, *Google*, available at https://developers.google.com/analytics/devguides/collection/ga4/policy.

Google's "Manage user privacy" page states: "At Google, we are keenly aware of the trust you place in us and our responsibility to keep your privacy and data secure. As part of this responsibility, we provide information and tools that developers can use to help enable and manage user privacy."[100]

95. For example, Google Analytics customers can disable Google Analytics functionality on a webpage to honor visitors' opt-out choices, without removing the Google Analytics tag itself.[101] A customer can do this by simply setting a window property to "true."

96. In August 2020, Google Analytics also launched "Consent mode" for its customers.[102] For customers who choose to implement Consent Mode, the Google Analytics tag will alter its settings based on the websites' implementation of Consent Mode and the users' consent statuses.[103] For instance, the Latham & Watkins LLP website (*lw.com*) immediately asks users, irrespective of the browsing mode, whether they consent to analytics cookies:

---

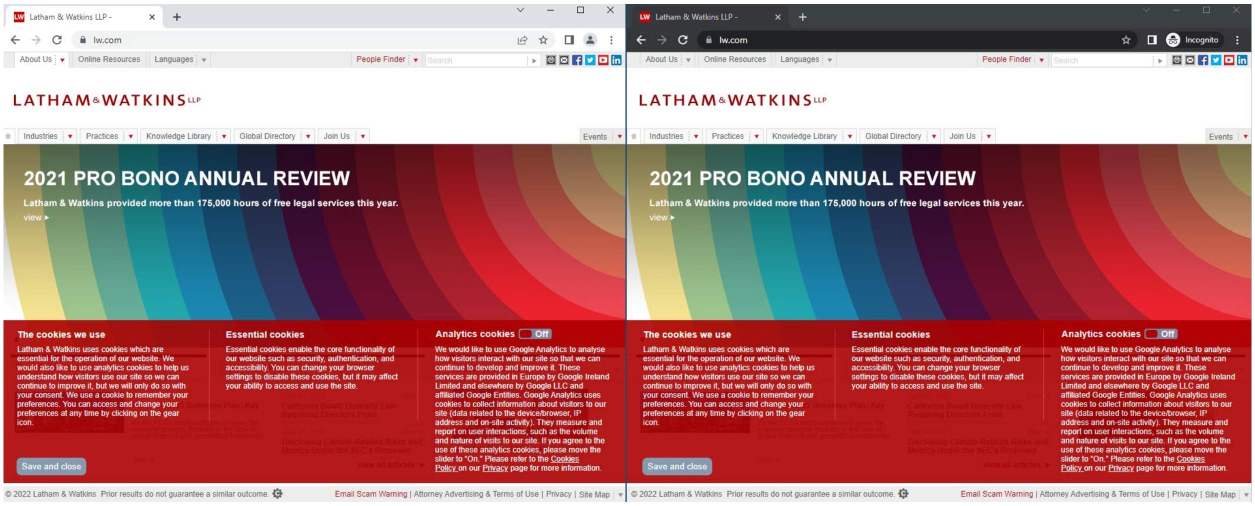
[100] "Manage user privacy," Tags, *Google*, available at https://developers.google.com/tag-platform/devguides/privacy.

[101] "Disable Google Analytics measurement," *Google Analytics, Google*, available at https://developers.google.com/analytics/devguides/collection/gtagjs/user-opt-out; "Manage user privacy," *Tags*, *Google*, available at https://developers.google.com/tag-platform/devguides/privacy.

[102] "Consent Mode," *Analytics Help*, *Google*, available at https://support.google.com/analytics/answer/9976101?hl=en; Herman, Scott, "Measure conversions while respecting user consent choices," *Google Marketing Platform*, *Google*, September 3, 2020, available at https://blog.google/products/marketingplatform/360/measure-conversions-while-respecting-user-consent-choices/.

[103] Deposition of Steve Ganem, March 23, 2022, pp. 78-80 ("The Witness: I believe what Consent Mode refers to here in this context is an API of that name to help our customers provide cookie consent options and banners to their end users should they need to…Consent Mode does govern some of the data collection to Google Analytics when it's used…The Consent Mode settings that are in place for a given client, browser client, govern whether or not cookies, both Analytics-related cookies and ads-related cookies, can be read or written.").

Figure 34
Cookie Consent Form Example



97. As another example, websites that enable Google Analytics Advertising Features can use the *allow_google_signals* and *allow_ad_personalization_signals* controls to prevent events sent from *gtag.js* from being used for ads personalization.[104] Further, websites can signal to Google that "events sent from the tag will not be used for ads personalization and demographics and interests reports" and can even restrict data processing by Google.[105]

98. As yet another example, and as explained in public documentation, Google uses IP addresses to provide security for customers and for IP geolocation purposes.[106] Google Analytics offers customers the option to anonymize users' IP addresses (known as IP address

---

[104] As noted in public documentation, events from *gtag.js* can still be used for demographics and interests reporting. *See* "Manage user privacy," *Tags*, *Google*, available at https://developers.google.com/tag-platform/devguides/privacy.

[105] "Manage user privacy," *Tags*, *Google*, available at https://developers.google.com/tag-platform/devguides/privacy.

[106] "Safeguarding your data," *Analytics Help*, *Google*, available at https://support.google.com/analytics/answer/6004245.

anonymization).[107] IP address anonymization is an option in both Universal Analytics and Google Analytics 4 and is enabled by default in Google Analytics 4.[108]

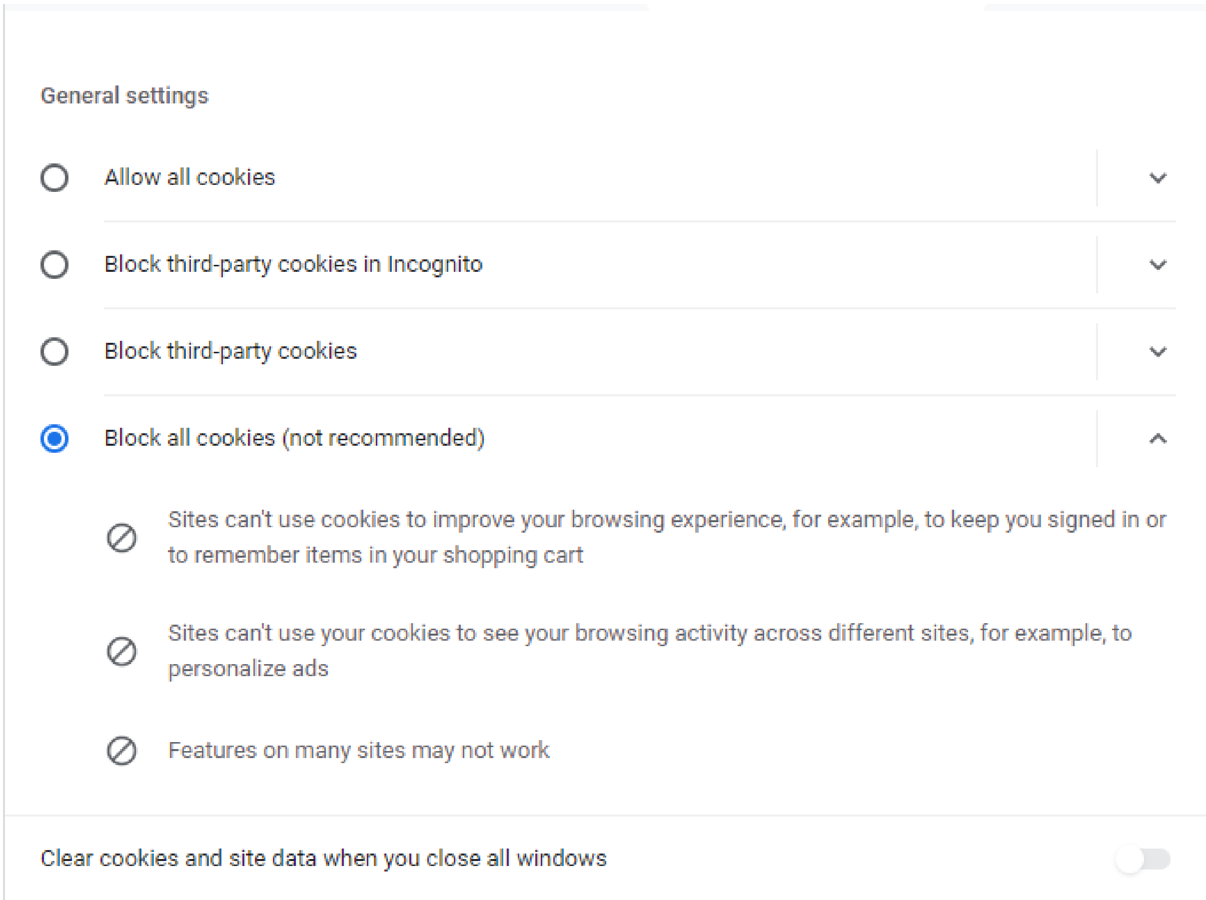
2. Users Can Affect Data Transmissions to Google Analytics

99. Internet users can also affect whether data relating to their interactions with a website is sent to Google Analytics. For example, users can prevent transmission of cookies to Google Analytics by using browser cookie settings. In Chrome, these settings can be accessed by typing *chrome://settings/cookies* to the address bar or by accessing settings through navigation panes on the browser. This allows users to select their desired cookie settings in both Regular and Private Browsing Modes.

[107] "IP Anonymization (or IP masking) in Google Analytics," *Analytics Help*, *Google*, available at https://support.google.com/analytics/answer/2763052.

[108] "IP Anonymization (or IP masking) in Google Analytics," *Analytics Help, Google,* available at https://support.google.com/analytics/answer/2763052.

Figure 35
Chrome Cookie Settings Page



100. The "Block all cookies" option prevents first- and third-party cookies from being set and transmitted, which will block Google Analytics first-party cookie values.[109] Users also can enable the "*Clear cookies and site data when you close all windows*" option, which erases cookie

[109] The option to "Block all cookies" as shown in the **Figure** was first available in Chrome 82 starting in March 2020, and in earlier versions, since at least 2013, users could block cookies by turning on "Block sites from setting any data" in the settings. See, e.g., Spadafora, Anthony "New Chrome build will allow you to block all cookies," *TechRadar*, March 17, 2020, available at https://www.techradar.com/news/new-chrome-build-will-allow-you-to-block-all-cookies; "Manage your cookies and site data," *Google*, archived by the *Wayback Machine*, May 17, 2013, available at https://web.archive.org/web/20130517102706/https://support.google.com/chrome/answer/95647?hl=en#.

values set in browser memory.[110] This means that cookies would be cleared each time the user closes the browser, preventing tracking of the user's interactions with a website based on the cleared cookie values.

101. The cookie settings page shown in **Figure 35** also gives users the option to "Block third-party cookies," which prevents the setting and transmission of third-party cookies, but not first-party cookies. For example, if a Google Analytics customer enables Analytics Advertising Features, which will enable the collection of Google third-party advertising cookies by Google Analytics, the "Block third-party cookies" option would prevent Google Analytics from collecting those cookies when a user visits the customer's website. However, this option would not prevent Google Analytics first-party cookies from being set and sent by the website to Google Analytics.

102. Users can also install an extension called the "Google Analytics Opt-out Browser Add-on," which is described in Google Analytics documentation.[111,112] According to the Chrome extension page illustrated below, this extension prevents the Google Analytics JavaScript code from transmitting information to Google Analytics, and there are more than a million users of this extension in Chrome. This extension can be used in both Regular and Private Browsing Modes.

[110] This option to clear cookies when a browser session is closed has been available since at least 2014 when it was called "Keep local data only until you quit your browser." *See*, e.g., Paul, Ian, "How to automatically delete your cookies every time you close your browser," *PCWorld,* November 11, 2014, available at https://www.pcworld.com/article/436317/how-to-automatically-delete-your-cookies-every-time-you-close-your-browser.html.

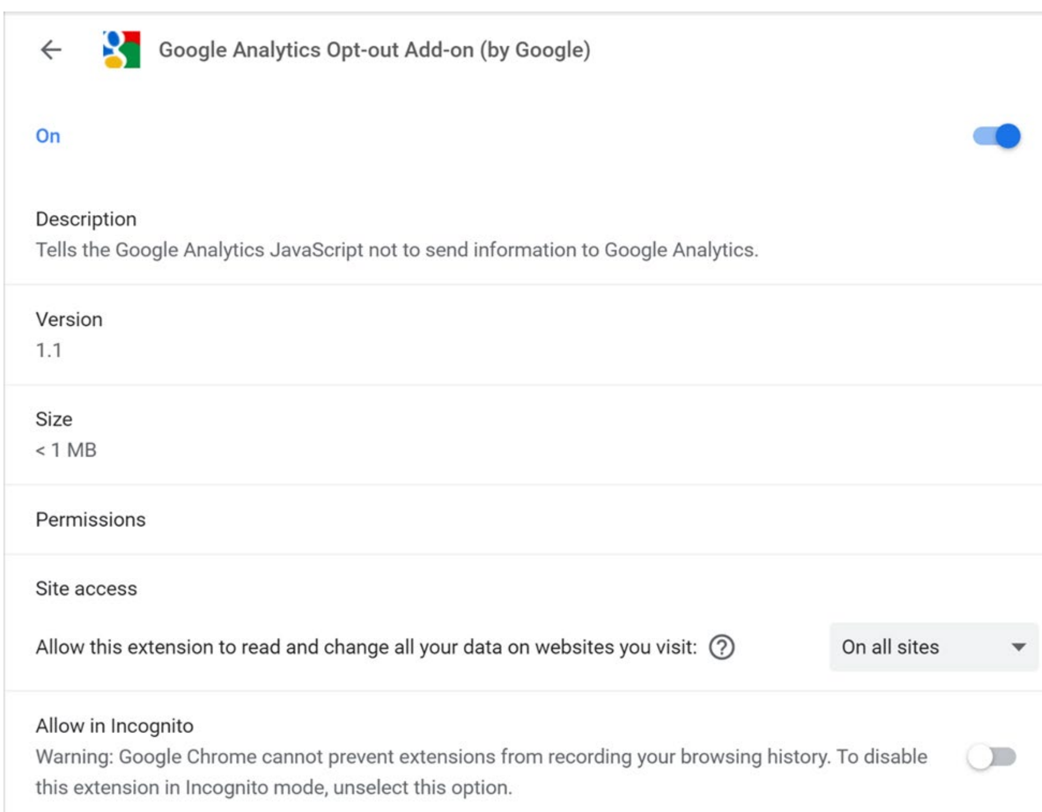
[111] "Google Analytics Opt-out Browser Add-on," *Google Tools*, *Google*, available at https://tools.google.com/dlpage/gaoptout/.

[112] "Google Analytics Opt-out Add-on (by Google)," *Chrome Web Store*, *Google*, available at https://chrome.google.com/webstore/detail/google-analytics-opt-out/fllaojicojecljbmefodhfapmkghcbnh?hl=en.

To be used in Private Browsing Mode, a user must allow for this explicitly in Chrome Settings for Extensions as illustrated in **Figure 37** below.

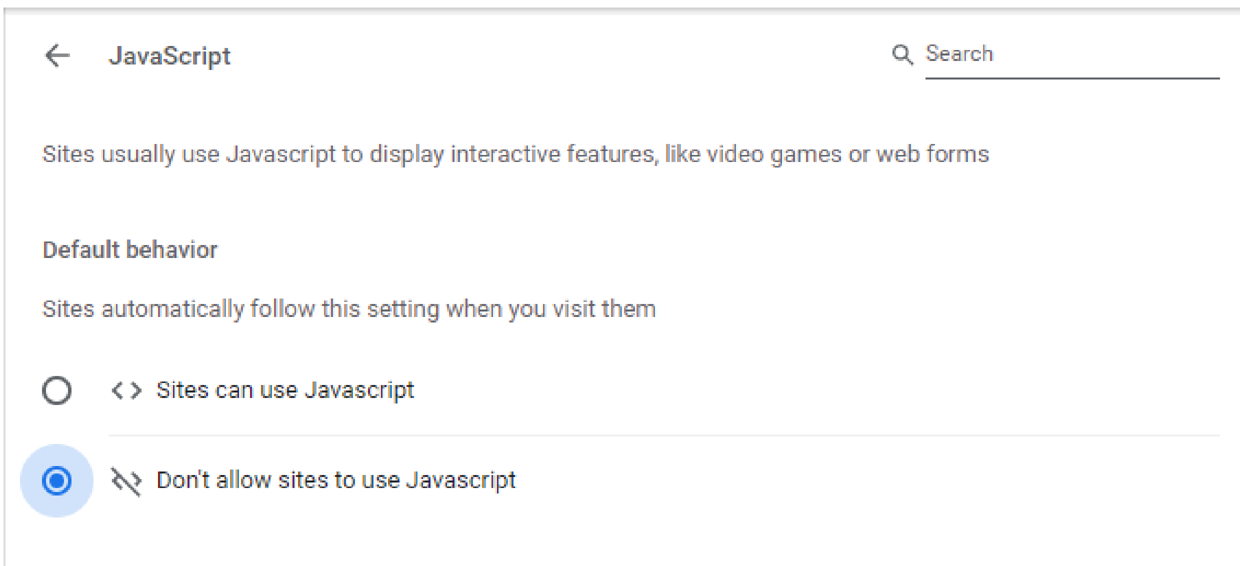
Figure 36
Google Analytics Opt-out Add-on Extension Page

Figure 37
Google Analytics Opt-out Add-on Settings Page



103. Users can also block JavaScript, which is how Google Analytics functionality is executed.[113] Modern browsers contain built-in settings that disable JavaScript, irrespective of the browsing mode.[114] Users also can install add-ons or extensions that would block JavaScript execution.[115] To disable JavaScript using settings on Chrome, for example, users can enter *chrome://settings/content/javascript* in the address bar or navigate to the same page using setting pages. Then a user can select if JavaScript is allowed as illustrated below:

Figure 38
JavaScript Chrome Settings



113 "Hello Analytics API: JavaScript quickstart for web applications," *Google Analytics*, *Google*, available at https://developers.google.com/analytics/devguides/config/mgmt/v3/quickstart/web-js.

114 "Disable JavaScript in Chrome, Edge, Firefox, Opera, Internet Explorer on Windows 11/10," *The Windows Club*, available at https://www.thewindowsclub.com/disable-javascript-chrome-ie-firefox-opera.

115 "Sybu JavaScript Blocker," *Chrome Web Store*, *Google*, available at https://chrome.google.com/webstore/detail/sybu-javascript-blocker/ceicidjdokcfbnkdenbhmnonehglgilk?hl=en.

104. Such settings block execution of any JavaScript code and therefore block transmission of cookie values triggered by the JavaScript code embedded in websites in both Regular and Private Browsing Modes. Disabling JavaScript permanently is generally not recommended as it might interfere with some website functionalities that rely on JavaScript execution such as login forms and advanced interactive features.[116] However, depending on the user's browsing behavior, it may not lead to reduced functionality for many websites.[117] Disabling JavaScript still allows users to select their desired cookie settings in both Regular and Private Browsing Modes.

105. Users can also mask their IP address from Google Analytics and any other Internet services by using a VPN in both Regular and Private Browsing Modes.[118] There are many VPN extensions available for browsers, as well as standalone applications that will mask IP addresses not only for Web browsing but also other types of Internet communications. Some prominent VPN services are ExpressVPN, Surfshark, NordVPN, ProtonVPN, and IPVanish.[119] In fact, 41% of US and UK users use VPN services at least once a week.[120]

[116] Patwegar, Waseem "How to Enable or Disable JavaScript In Chrome Browser," *Techbout*, available at https://www.techbout.com/enable-disable-javascript-chrome-36943/; Hoffman, Chris, "What Is NoScript, and Should You Use It to Disable JavaScript?" *How-To Geek*, November 21, 2017, available at https://www.howtogeek.com/138865/htg-explains-should-you-disable-javascript/.

[117] Finley, Klint, "I Turned Off JavaScript for a Whole Week and It Was Glorious," *Wired*, November 18, 2015, available at https://www.wired.com/2015/11/i-turned-off-javascript-for-a-whole-week-and-it-was-glorious/.

[118] See VPN test results, described further in **Section V.D.5** below and in my backup materials. The user's IP address would not be masked from the VPN provider itself.

[119] Hodge, Rae, Holly, Russell, & David Gewirtz, "Best VPN Service of 2022," *CNET*, March 26, 2022, available at https://www.cnet.com/tech/services-and-software/best-vpn/.

[120] "How often do you use a VPN?" Statista, available at https://www.statista.com/statistics/1219770/virtual-private-network-use-frequency-us-uk/.

B. Google Ad Manager

106. Google Ad Manager is an ad management platform targeted to publishers who have significant direct sales.[121] It offers a central location for publishers to define their ad inventory and create, manage, and analyze reports on their advertising campaigns. It also offers ad-serving capabilities, connecting to ad-exchanges to select the best ad to display on a website.[122]

107. Google Ad Manager is a solution for publishers who are interested in displaying ads but might not have the technical expertise to develop their own ad server. To use Google Ad Manager, the publisher must create an account and accept the Google Ad Manager terms, then insert a "tag," which is a small snippet of code, for each location where the publisher wants to show an ad. Below is an example of instructions for a website to use Google Ad Manager tag:[123]

[121] "Advertising with Google Ad Manager," *Google Ad Manager Help*, *Google*, available at https://support.google.com/admanager/answer/6022000?hl=en.

[122] "Advertising with Google Ad Manager," *Google Ad Manager Help*, *Google*, available at https://support.google.com/admanager/answer/6022000?hl=en.

[123] "Get Started with Google Publisher Tags," *Google Publisher Tag*, *Google*, available at https://developers.google.com/publisher-tag/guides/get-started.

Figure 39
Google Ad Manager Instructions to Publishers

Display your own ad

Using the `hello-gpt.html` file created in the Display a test ad section, replace the code in the header with code specifying inventory from your own Ad Manager network.

Note: Before you can display an ad from your Ad Manager network, you will need to make sure there's an active line item already trafficked in the "Ready" status. Learn more about creating line items in the Ad Manager help center.

1. Generate an ad tag for the ad unit you'd like to display. Learn more about generating ad tags in the Ad Manager help center.
2. Copy the ad tag code provided in the **Document header** section and use it to replace the corresponding code in the <head> of your HTML document.

```
<head>
 <meta charset="utf-8">
 <title>Hello GPT</title>
 <script async src="https://securepubads.g.doubleclick.net/tag/js/gpt.js"></script>
 <script>
   window.googletag = window.googletag || {cmd: []};
   googletag.cmd.push(function() {
     googletag
         .defineSlot(
             'ad-unit-path', [width, height], 'div-id')
         .addService(googletag.pubads());
     googletag.enableServices();
   });
 </script>
</head>
```

108. After placing the tag code on the website, the website developer must select "campaigns," which are the settings that determine how and where ads will be shown on the website.[124] When a website loads, the ad tag initiates an HTTP request from the user's browser to an ad server that can include the following information: the HTTP header, an IP address, a user identifier, custom targeting criteria set by the publisher, and a "correlator" value shared between ad requests on the same page. Google Ad Manager then selects the best ad available and serves it

---

[124] "Get started with ads in Google Ad Manager," *Google Ad Manager Help*, *Google*, available at https://support.google.com/admanager/answer/6027116?hl=en&ref_topic=7506292.

back to the user's browser.[125] The following excerpt from Google Ad Manager documentation illustrates how the various types of data in an ad request are used.[126]

Figure 40
Use of Data by Google Ad Manager

1. An ad request passes information to the ad server

Ad requests are triggered by resources (for example, JavaScript libraries like GPT on web pages, or application code on a mobile app) rendered by a user's web browser or mobile device, and they initiate an HTTP request to an ad server.

Information about the user and the device is passed within the request to Ad Manager, allowing Ad Manager to match the right ad with the right user. Five crucial pieces of data are transmitted in the ad request:

- The HTTP header
- The IP address
- A user identifier (containing no personally identifiable information), which could be one of the following:
  - Resettable mobile device advertising ID (for in-app ad requests; examples: AdID for Android; IDFA for iOS; other identifiers for devices such as Roku)
  - PPID (for publishers that have it set in their ad requests)
  - DoubleClick cookies (for desktop and mobile browsers)
- The custom targeting criteria set by the publisher in the Ad Manager ad tags
- A "correlator" value shared between ad requests on the same page

The table below details how this data is used in the ad selection process. The Ad Manager ad server only checks the user identifiers described above if they are allowed by the individual user; that is, if the user hasn't opted out or blocked them via browser settings or mobile tracking restrictions.

109. Google Ad Manager is not the only product on the market that offers ad serving capabilities by connecting publishers to ad exchanges. There are several competing services that allow website developers to incorporate ads through the use of tags and a third-party ad-management platform. These companies operate in the field of "programmatic advertising," which

[125] "Ad selection white paper," *Google Ad Manager Help*, *Google*, available at https://support.google.com/admanager/answer/1143651#zippy=%2Csummary-of-data-types-table.

[126] "Ad selection white paper," *Google Ad Manager Help*, *Google*, available at https://support.google.com/admanager/answer/1143651#zippy=%2Csummary-of-data-types-table.

is the "use of technology to buy and sell digital ads."[127] Some of Google Ad Manager's competitors are Facebook Ads Manager,[128] Amazon DSP,[129] OpenX,[130] and AdButler.[131] The use of third-party code is essential to enable these services, as they simplify the ad-serving process for publishers who do not have the technical expertise to develop their own ad-serving technology from scratch.

1. Data Transmissions to Google Ad Manager Are Impacted by the Choices of Publishers

110. Publishers can adjust several parameters that change how Google Ad Manager functions in their website. For example, they can modify the type of ads served, change the size and resolution of the ad,[132] or alter privacy parameters. These modifications have a direct impact on the type of data Google receives and how the data is transferred. Google offers several privacy settings to publishers. One of these settings is the ability to serve "limited ads," which are ads that "disable all personalization and features that require use of a local identifier."[133] This setting allows

[127] "A beginner's guide to programmatic advertising," *Amazon Ads*, *Amazon*, March 11, 2021, available at https://advertising.amazon.com/blog/programmatic-advertising.

[128] "Facebook Advertisers: Direct vs Programmatic Buying Trends," *MediaRadar*, May 27, 2021, available at https://mediaradar.com/blog/facebook-advertisers-direct-vs-programmatic/.

[129] "What is Amazon DSP?" *Amazon Ads*, *Amazon*, available at https://advertising.amazon.com/solutions/products/amazon-dsp.

[130] "OpenX," *OpenX*, available at https://www.openx.com/.

[131] "AdButler," *AdButler*, available at https://www.adbutler.com/.

[132] "Ad sizes," *Google Publisher Tag*, *Google*, available at https://developers.google.com/publisher-tag/guides/ad-sizes.

[133] "Limited Ads," *Google Ad Manager Help*, *Google*, available at https://support.google.com/admanager/answer/9882911.

publishers to restrict data processing by Google.[134] In addition, website developers can opt out of the use of personalized ads,[135,136] and they are required to have and abide by a privacy policy that clearly discloses to their users that third parties may be placing and reading cookies on their users' browsers.[137] For example, publishers can opt out of showing users who are signed into their Google account personalized ads across devices.[138] Developers also have a choice of whether or not to send publisher provided identifiers (PPID), which are used for ad frequency capping, audience segmentation, and other delivery controls across devices.[139] Though using first-party cookies to implement programmatic frequency caps is the default, publishers have the ability to disable the use of these first-party cookies.[140] If a publisher decides not to share these with Google, these identifiers will not appear anywhere on Google's systems.[141] Publishers can also opt out of first-

---

[134] "Restricted data processing (CCPA) settings in Google's publisher ad tags," *Google Ad Manager Help*, *Google*, available at https://support.google.com/admanager/answer/9598414#other-tags.

[135] "Ad personalization settings in Google's publisher ad tags," *Google Ad Manager Help*, *Google*, available at https://support.google.com/admanager/answer/7678538.

[136] "Personalized and non-personalized Ads," *Google Ad Manager Help*, *Google*, available at https://support.google.com/admanager/answer/9005435.

[137] "Google Publisher Policies," *Google Ad Manager Help*, *Google*, available at https://support.google.com/admanager/answer/10502938?.

[138] This option is available from the Admin section of the publisher's Google Ad Manager account. *See* "Enable Google signed-in, cross-device personalized ads," *Google Ad Manager Help*, *Google*, https://support.google.com/admanager/answer/7204537?hl=en.

[139] "About publisher provided identifiers," *Google Ad Manager Help*, *Google*, available at https://support.google.com/admanager/answer/2880055?hl=en.

[140] "Use first-party cookies for programmatic frequency caps," *Google Ad Manager Help*, *Google*, available at https://support.google.com/admanager/answer/10650804?hl=en.

[141] Deposition of Glenn Berntson Volume I, March 18, 2022, pp. 166 ("There are additional publisher controls that could have an indirect impact here. An example is if a publisher chooses to not use PPID, they wouldn't provide PPID, and so therefore there would be no PPID. And so, it is a publisher choice as to whether the PPID available in the first place for our systems.").

party pseudonymous identifiers set by Google Ad Manager to support functions like frequency capping, in which case the cookie value is not created.[142]

111. Website developers can also use Google Ad Manager's privacy and messaging tool to select the particular privacy regulations their website complies with and optionally message the website's users about these practices to obtain consent.[143] When a user visits a website that displays the optional message and does not accept the terms, they will be served ads that are not personalized, meaning that they will not be based on information about user behavior and will instead be based on context such as city-level geo-targeting and website content.[144]

2. Users Can Affect Data Transmissions to Google Ad Manager

112. There are also tools available to browser users that affect data flows to Google Ad Manager. These tools include blocking all cookies, blocking third-party cookies, and enabling "clear cookies and site data when you close all windows." I discuss the use of cookie options in **Section V.D.1** and similar conclusions apply to Google Ad Manager, namely that Internet users can affect the transmission of cookie values to Google Analytics for both Regular and Private Browsing Modes.

---

[142] Deposition of Glenn Berntson Volume I, March 18, 2022, pp. 166-7 ("There are other cases, the first-party IDs, pseudonymous identifiers, that we'll set to the publisher domain to support things like frequency capping, which I described previously. And if the publisher says, 'No, I don't want you to set that cookie,' then we won't. It's under the publisher control.").

[143] The tool allows for messaging related to GDPR, CCPA, IDFA, and ad blocking recovery messages. *See* "About privacy & messaging," *Google Ad Manager Help*, *Google*, available at https://support.google.com/admanager/answer/10075997?hl=en.

[144] "Google and TCF 2.0: how to collect consent for personalized ads," *iubenda*, available at https://www.iubenda.com/en/help/16041-google-tcf-consent-personalized-ads; "Personalized and Non-Personalized Ads," *Google Ad Manager Help*, *Google*, https://support.google.com/admanager/answer/9005435.

113. Similar to Google Analytics, functionality of Google Ad Manager relies on JavaScript code such that blocking JavaScript through settings would prevent data from being sent to Google Ad Manager.

114. Chrome users can also install extensions that may alter the flow of data to Google Ad Manager, such as Ad Blocker extensions. For example, Chrome users can install the uBlock or AdBlock extensions which both are used by more than 10 million users according to the extension pages.[145] Users can also install the Interest-Based Advertising (IBA) Opt-out extension provided by Google which allows opting out of personalized ads. This extension allows users to opt out of DoubleClick advertising cookies, which are used by Google to display personalized ads.[146] In addition, users can also opt out of personalized ads on the NAI Consumer Opt Out page. This service allows users to "choose to opt out of Interest-Based Advertising from one, some or all participating NAI member companies on your browser."[147] Further, users can choose to install a dedicated standalone application that would block ads, such as AdGuard.[148]

115. Users can also affect personalized advertising functionalities by visiting *https://adssettings.google.com/*. If the user is signed in, they will be redirected to a page similar to the one shown below in **Figure 41**, where they can choose what types of ads they would like to

[145] "uBlock Origin," *Chrome Web Store*, *Google*, available at https://chrome.google.com/webstore/detail/ublock-origin/cjpalhdlnbpafiamejdnhcphjbkeiagm?hl=en; "AdBlock –- best ad blocker," *Chrome Web Store*, *Google*, available at https://chrome.google.com/webstore/detail/adblock-%E2%80%94-best-ad-blocker/gighmmpiobklfepjocnamgkkbiglidom?hl=en-US.

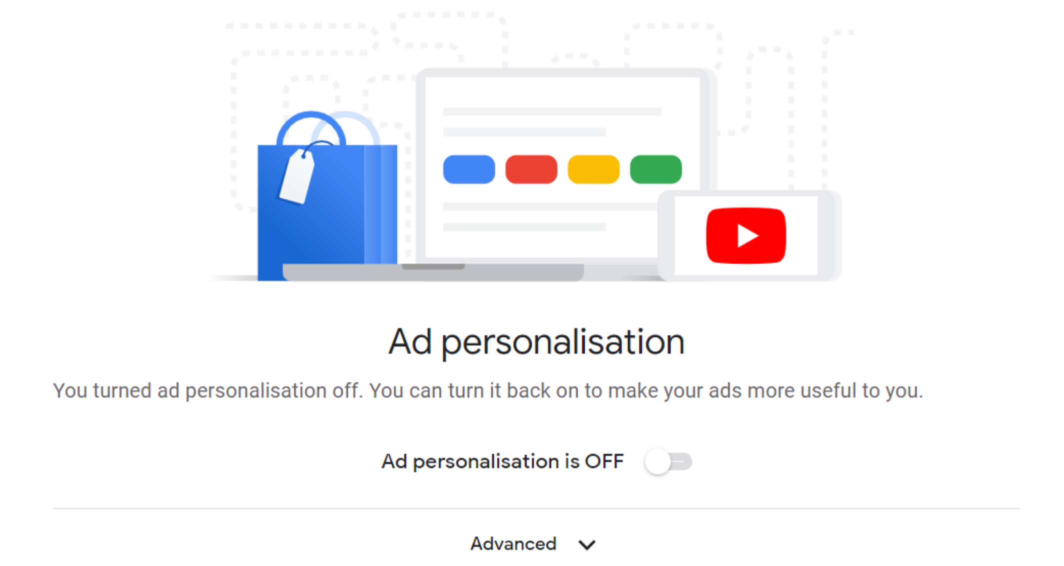
[146] "IBA Opt-out (by Google)," *Chrome Web Store*, *Google*, available at https://chrome.google.com/webstore/detail/iba-opt-out-by-google/gbiekjoijknlhijdjbaadobpkdhmoebb?hl=en.

[147] "Manage my Browser's Opt Outs," *NAI*, available at https://thenai.org/opt-out/.

[148] "AdGuard," *AdGuard*, available at https://adguard.com/en/welcome.html.

see or turn off ad personalization. If the user is not signed in, they will be redirected to a page similar to the one shown below in **Figure 42**, where they can turn off ad personalization on Google Search, YouTube, and Web.[149] In either case, they can also receive more information about online advertising.[150] Users can also arrive at these ad personalization settings through the use of AdChoices, an industry standard service implemented on some websites in the Google Display Network. The AdChoices icon appears on ads for users to click on. When users click on this icon, they are directed to the Google Ads personalization settings page.

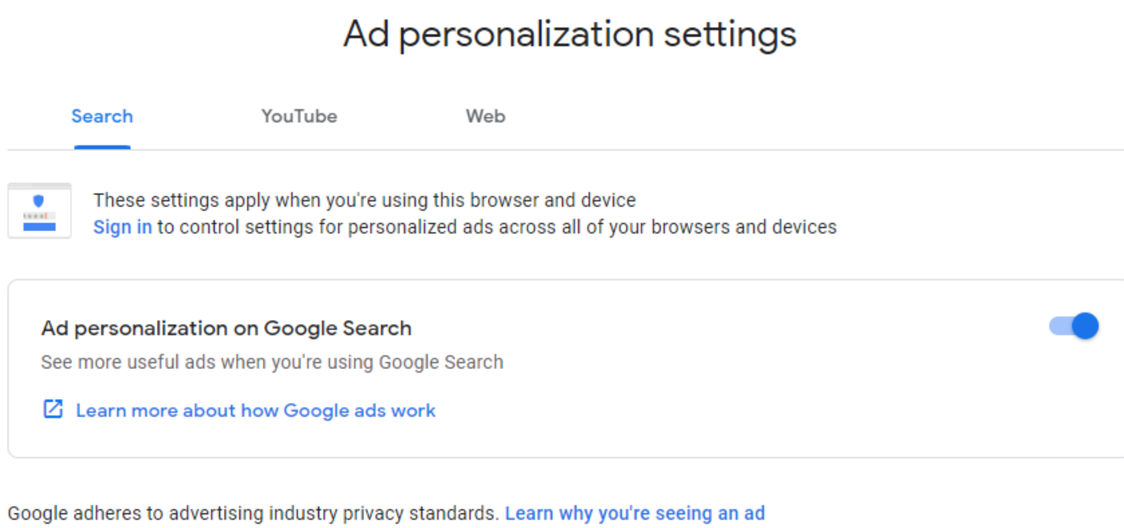
Figure 41
Ad Personalization Options - Signed in User



[149] If the user is not signed into a Google account and disables ad personalization on the web, the browser will remember this setting by setting the value of the ANID cookie to "OPT_OUT."

[150] "Ad Choices for the Google Display Network," *Google Ad Manager Help*, *Google*, available at https://support.google.com/admanager/answer/2695279?hl=en; "Block certain ads," *Ads Help*, *Google*, available at https://support.google.com/ads/answer/2662922?hl=en.

Figure 42
Ad Personalization Options - Signed Out User



116. Similar to Google Analytics, users also have an option to install standalone applications that change data flow to Google Ad Manager and other services. For example, users can install VPN applications that mask IP addresses and firewall applications that would block data transmissions to certain domains.

C. Private Browsing Modes Do Not Block All Transmissions to Third-Party Web-Services

117. As described in **Section IV**, Private Browsing Modes (1) prevent browsing history from being saved on the device, (2) prevent the user and browser in Private Browsing Sessions from accessing browsing history and cookies from Regular Mode session; and (3) discard cookies placed on the browser during the private browsing session when the session is closed. However, Private Browsing Modes are not designed to prevent browsers from sending all messages to web

services that a website developer has chosen to embed in their website.[151] Further, those messages would necessarily conform to multiple industry standards and protocols that are established by the community and are not unilaterally set by Google or any other company that offers a browser. These protocols and standards include, but are not limited to, HTTP messages with required fields, and IP addresses required to deliver those HTTP messages.

118. However, there are numerous *other* settings and features available in most major browsers (including Chrome) that would further enhance a user's privacy, for example by preventing the transmission of certain categories of At-Issue Data or obscuring that data. These settings include, but are not limited to, cookie settings, JavaScript extensions and settings, and various extensions and standalone applications that are designed to affect certain data transmissions. I have tested these features in both Private Browsing Mode and Regular Mode, and my tests confirm that they function as explained in public documentation and affect data flows to Google, irrespective of whether a user is browsing in Private Browsing Mode (these tests are described further in **Section V.D** below). And even though my tests focus separately on each setting, users can use combinations of these settings and extensions to select their optimal balance of privacy and user experience.

D. Testing of Browser Settings and Extensions that Impact Transmissions of At-Issue Data in Both Regular and Private Browsing Modes

119. As stated in **Section IV**, Private Browsing Modes in all major browsers conceal the user's browsing activity from other people who may use same device and ensure that cookie values

[151] For example, when accessing *https://www.nytimes.com/* in Private Browsing Mode for Chrome, Firefox, and Edge on Windows 10, there are several HTTP requests made to *news.google.com*. These requests are included in my backup materials.

generated during a Private Browsing Session are not shared with other browsing sessions and cannot be used to link Private Browsing Mode Activity to the user or her device after the Private Browsing Session is closed. However, Private Browsing Modes do not prevent websites—or the web-services deployed by websites—from knowing the simple fact that *a* user is interacting with the site or the service.[152]

120. To provide additional privacy, browsers (including Chrome) allow for the installation and modification of various settings and extensions, which significantly impact the extent to which browsers transmit certain data to Google and other domains in Regular and Private Browsing Modes.[153]

121. To evaluate the impact various settings and extensions have on the data that browsers may transmit to Google, I visited the same set of websites described in **Section IV.C.2.c** for Chrome (version 100) on Windows 10 (version 20H2). Based on my professional experience, these settings and extensions operate similarly across browsers and operating systems. Even though some settings might differ in how they are enabled or operate, users of all browsers and operating systems can find comparable options. I use Chrome to illustrate how settings affect the flow of the At-Issue Data.

---

[152] For example, when accessing https://www.nytimes.com in Private Browsing Mode for Chrome, Firefox, and Edge on Windows 10, there are several HTTP requests made to news.google.com. These requests are included in my backup materials.

[153] *See e.g.*, Hodge, Rae, "If You Care About Your Privacy, You Need to Change These Browser Settings Right Now," *CNET*, February 26, 2022, available at https://www.cnet.com/tech/services-and-software/if-you-care-about-your-privacy-you-need-to-change-these-browser-settings-right-now/; "Choose your privacy settings," *Google Chrome Help*, *Google*, available at https://support.google.com/chrome/answer/114836?hl=en&co=GENIE.Platform%3DDesktop.

122. I performed the following tests related to settings and extensions:

a. Cookie blocking test: all cookies allowed, third-party cookies blocked, and all cookies blocked;

b. JavaScript blocking test: JavaScript enabled, JavaScript disabled through browser settings, and JavaScript blocked through the Sybu browser extension;

c. uBlock extension test: uBlock Origin extension disabled and uBlock Origin extension enabled; and

d. Google Analytics Opt-out Add-on extension test: Google Analytics Opt-out Add-on disabled and Google Analytics Opt-out Add-on enabled.

123. I describe the testing process in **Appendix D**.

1. Browser Settings that Affect the Transmission of Cookie Values

124. As discussed in **Section III.B**, cookies are a sequence of characters that contain information used for various purposes, including but not limited to core website functionalities (*e.g.*, remembering which items a user placed for the checkout during online shopping or a time zone a user is located in) and for the delivery of targeted ads. Many browsers, including Chrome, Firefox, Edge, and Safari, give users the option to (1) allow all cookies, (2) block third-party cookies, and (3) block all cookies. These options are available for both Regular and Private Browsing Modes.[154,155]

---

[154] *See* Chrome cookie blocking settings example in **Section V.A.2.**

[155] *See e.g.,* "Cookie Rejection Report 2020," *Flashtalking*, available at https://static1.squarespace.com/static/5c17fee58ab722e19b765b9d/t/5ebb2cad66d47b4c5c9f21a9/1589324990858/Flashtalking_Cookie_Rejection_Report_2020.pdf. In 2020, an ad-serving company called Flashtalking published its annual *Cookie Rejection Report*, which

125. Exhibits 2.1-2.5 and 2.21-2.25 summarize the results of my cookie blocking tests across the selected five websites in Regular and Private Browsing Modes. The results demonstrate that Chrome cookie settings impact data transmissions in both Regular Mode and Private Browsing Modes. The "All Cookies Blocked" setting does block all cookie values from being transmitted to Google-associated domains.

126. The "Block Third-Party Cookies" setting blocks all third-party cookie value transmission to Google-associated domains. For example, third-party cookies such as IDE and NID are transmitted when all cookies are allowed but not when third-party cookies are blocked.[156]

127. Based on my testing, I conclude that cookie settings impact the transmission of cookie values in Regular and Private Browsing Modes. The cookie blocking settings allow users to block third-party or all cookies. If a user blocks third-party cookies, no third-party cookies will be sent to third-party domains, which includes Google-associated domains. If a user blocks all

examines cookies being blocked or deleted by web browsers. The company evaluated data from 36 different advertisers over a 30-day period in 2019, covering over six billion impressions. The report found that on average, 64% of cookies were rejected across devices, with a 41% rejection rate for desktop, 73% rejection rate for tablet, and 79% rejection rate for mobile devices. Cookie rejection occurs because users are in an environment where cookies do not function or because browsers implement cookie blocking settings.

[156] There are a limited number of instances that require further clarification. The third-party cookie named DSID is associated with a transmitted value of "NO_DATA" in the cases of https://www.cnn.com/, https://www.washingtonpost.com/, and https://www.latimes.com/. DSID cookie "is used to identify a signed-in user on non-Google sites and to remember whether the user has agreed to ad personalization." As the value suggests, no data are transmitted in these cases as I performed my testing without being signed in. Therefore, the DSID with a value of "NO_DATA" cannot be used to track users or to serve targeted ads. See "How Google Uses Cookies," *Google Privacy & Terms*, *Google*, available at https://policies.google.com/technologies/cookies?hl=en-US. I provide a more extensive discussion of other, similar examples of cookie value transmissions in **Appendix F**.

cookies, then no cookies are sent to any domains including Google-associated domains, irrespective of the browsing mode.

2. *Users Can Block Execution of JavaScript Code on Webpages*

128. JavaScript is a programming language widely used to enable dynamic and responsive content of websites such as content updated based on user actions, interactive maps, and others.[157] Even though JavaScript is present on most modern websites, it is not as fundamental of a component of webpages as HTML. Therefore, websites that do not rely on certain advanced and complex features would still be functional for most users if JavaScript were disabled. An example of the features that typically would not work and might impact user experience is logging in to the website. Not all websites contain this functionality and even if they do, a website login often is not required to browse the website. Since in many cases JavaScript is used to enable advertising and analytics services, restricting the use of JavaScript in webpages may reduce the amount of advertising content and the amount of time required to load a webpage. For example, as **Figure 43** shows, when I visit *https://www.thesaurus.com/browse/analyses/* with JavaScript execution allowed, the top part of the website even without scrolling down contains three ads. In contrast, as **Figure 44** shows, when I visit the same webpage after blocking JavaScript, the banners ads are gone, which some users may find desirable.

[157] "What is JavaScript?" *MDN Web Docs*, *Mozilla Corporation*, available at https://developer.mozilla.org/en-US/docs/Learn/JavaScript/First_steps/What_is_JavaScript.

Figure 43
Example of Website with Allowed JavaScript Execution

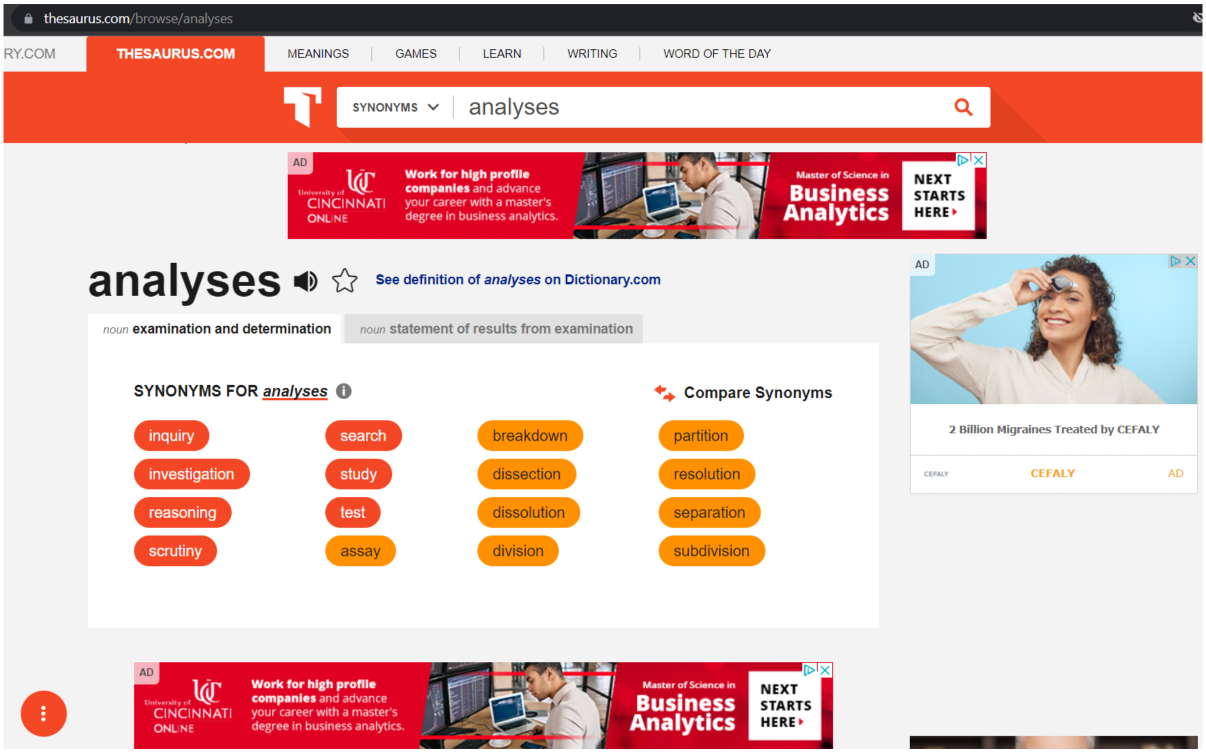
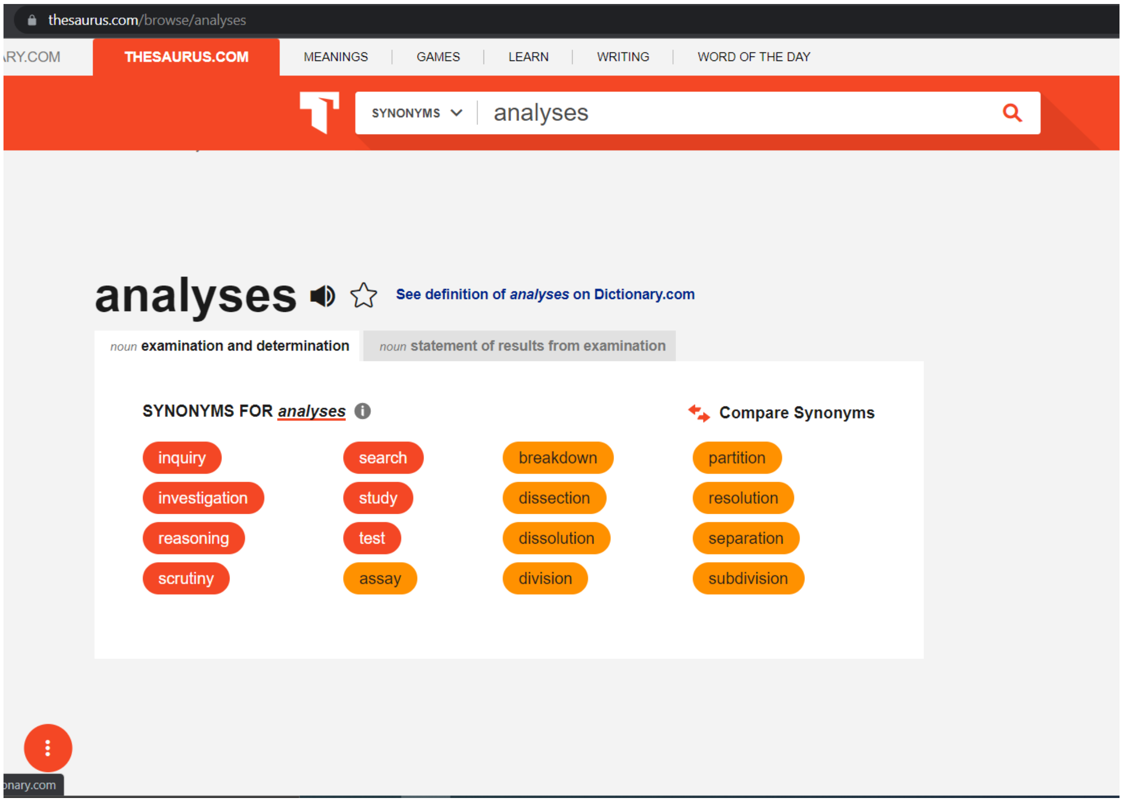


Figure 44
Example of Website with Blocked JavaScript Execution

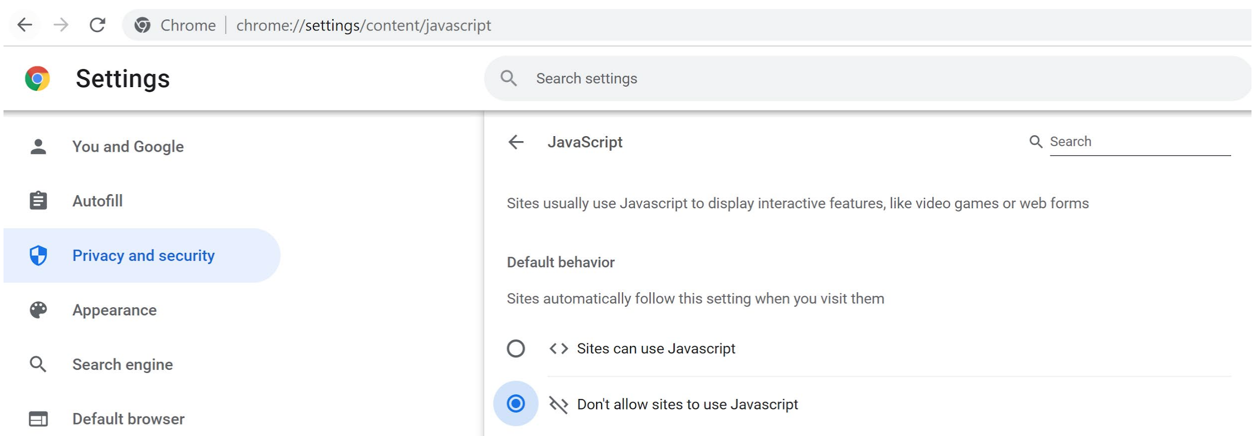


129. As **Figure 43** and **Figure 44** suggest, browsers have settings to block JavaScript execution. Furthermore, restricting execution of JavaScript code may limit the transmission of At-Issue Data to Google. Such settings, however, will not impact data transmissions that are not triggered by JavaScript code.

130. Users can restrict the execution of JavaScript on web pages either through browser settings or by using browser extensions that are designed to restrict JavaScript execution such as the Sybu extension. Though I present only this example in my report, many similar extensions are available on all major browsers.

131. To disable JavaScript execution in the Chrome browser, a user can visit *chrome://settings/content/javascript* either through the address bar or by using settings navigation buttons, and then select "Don't allow sites to use JavaScript," as illustrated in **Figure 45** below.

Figure 45
JavaScript Execution Settings in Chrome



132. Users can install extensions by visiting the Chrome Web Store. To illustrate an extension that disables JavaScript, I used the Sybu extension which has more than 10,000 users.[158] The key difference between browser setting- and extension-based JavaScript blocking is that extensions may include additional settings that allow users to choose how strict JavaScript blocking should be. For example, the settings page of the Sybu extension includes a "My Rules" option that by default blocks several types of Google-related JavaScript code from executing.

158 "Sybu JavaScript Blocker," *Chrome Web Store*, *Google*, available at https://chrome.google.com/webstore/detail/sybu-javascript-blocker/ceicidjdokcfbnkdenbhmnonehglgilk.

133. Exhibits 2.6-2.10 and 2.26-2.30 illustrate the results of my JavaScript blocking tests. Blocking JavaScript through settings prevents all cookies from being sent to Google-associated domains.

134. Similarly, the Sybu extension limits certain transmissions of cookie values to Google-associated domains. Compared to JavaScript settings, it allows users to define custom rules to block or allow certain domains.

135. Based on my JavaScript blocking tests, I conclude that settings and extensions available to browser users are effective at blocking JavaScript execution and transmission of certain cookie values to Google-associated domains.

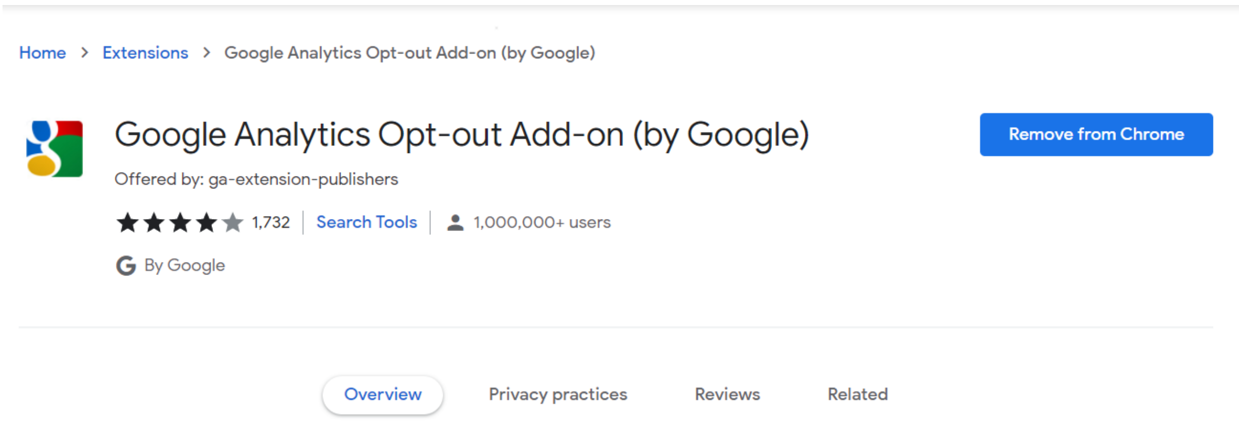
3. Add-Ons and Extensions Can Be Used to Restrict Data Transmission to Google Analytics

136. As I mentioned above, Chrome allows for the installation of extensions and add-ons that prevent or restrict certain data transmissions. For example, to affect the At-Issue Data being transmitted to Google Analytics, users can install Google Analytics Opt-out Add-on extension, which focuses on restricting data transmissions associated with Google Analytics.[159] This extension has been installed by more than 1 million users.[160]

[159] "Google Analytics Opt-out Add-on (by Google)," *Chrome Web Store*, *Google*, available at https://chrome.google.com/webstore/detail/google-analytics-opt-out/fllaojicojecljbmefodhfapmkghcbnh?hl=en.

[160] "Google Analytics Opt-out Add-on (by Google)," *Chrome Web Store*, *Google*, available at https://chrome.google.com/webstore/detail/google-analytics-opt-out/fllaojicojecljbmefodhfapmkghcbnh?hl=en.

Figure 46
Google Analytics Opt-out Add-on Page on Chrome Store



137. My testing of the impact of Google Analytics Opt-out Add-on extension on data transmissions is illustrated in Exhibits 2.11-2.15 and 2.31-2.35. My results show that cookies associated with Google Analytics, including *_ga*, *_gid*, and *_gaexp*, are not transmitted to Google Analytics domains when I enabled the Google Analytics Opt-out Add-on extension.

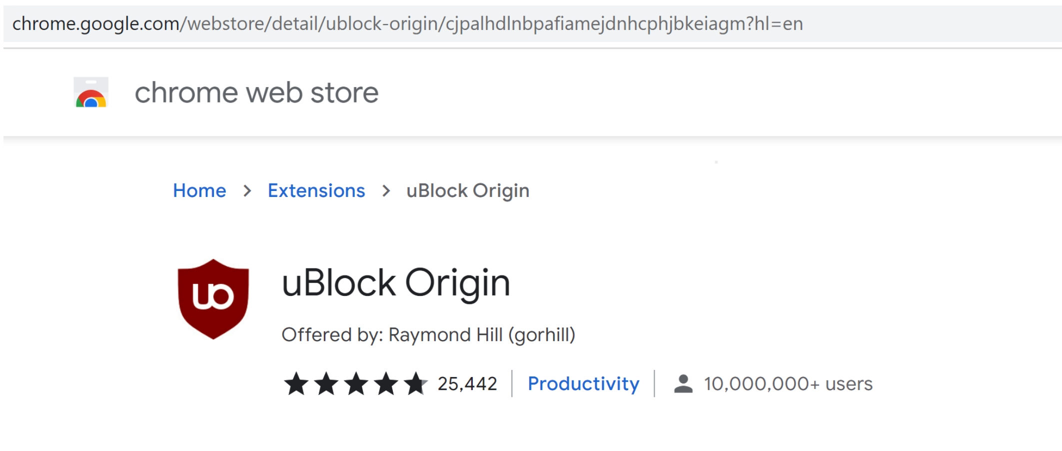
138. My tests illustrate that users who wish to restrict data transmissions to Google Analytics can use the Google Analytics Opt-out Add-on extension that effectively restricts data transmission of cookie values associated with Google Analytics.

4. Users Can Block Ads and Other Content Using Add-Ons and Extensions

139. Similar to the Google Analytics Opt-out Add-on extension that focuses on restricting data transmissions associated with Google Analytics, users have the ability to install extensions that block advertisements and other content from loading on websites. One example of

such an extension is uBlock Origin ("uBlock") which has more than 10 million installs on Chrome as illustrated in **Figure 47** below.[161]

Figure 47
uBlock Extension Page on Chrome Store



140. Exhibits 2.16-2.20 and 2.36-2.40 illustrate results of my testing for the uBlock extension. I did not observe any cookies being transmitted to Google-associated domains in Private Browsing Mode. I similarly observe most cookies being blocked in Regular Mode except an NID cookie on *https://www.nytimes.com/* which is transmitted to *https://news.google.com/* and *https://accounts.google.com/*. I understand that uBlock filtering relies on several default lists of domains which a user can supplement as shown in the settings page of uBlock illustrated below in **Figure 48**. As *https://news.google.com and https://accounts.google.com/* are not by default included in the filter list, the extension will only block these transmissions if a user modifies the setting page as illustrated in **Figure 49** below.

[161] "uBlock Origin," *Chrome Web Store*, *Google*, available at https://chrome.google.com/webstore/detail/ublock-origin/cjpalhdlnbpafiamejdnhcphjbkeiagm?hl=en.

CONFIDENTIAL – SUBJECT TO PROTECTIVE ORDER

Figure 48
uBlock Settings Page

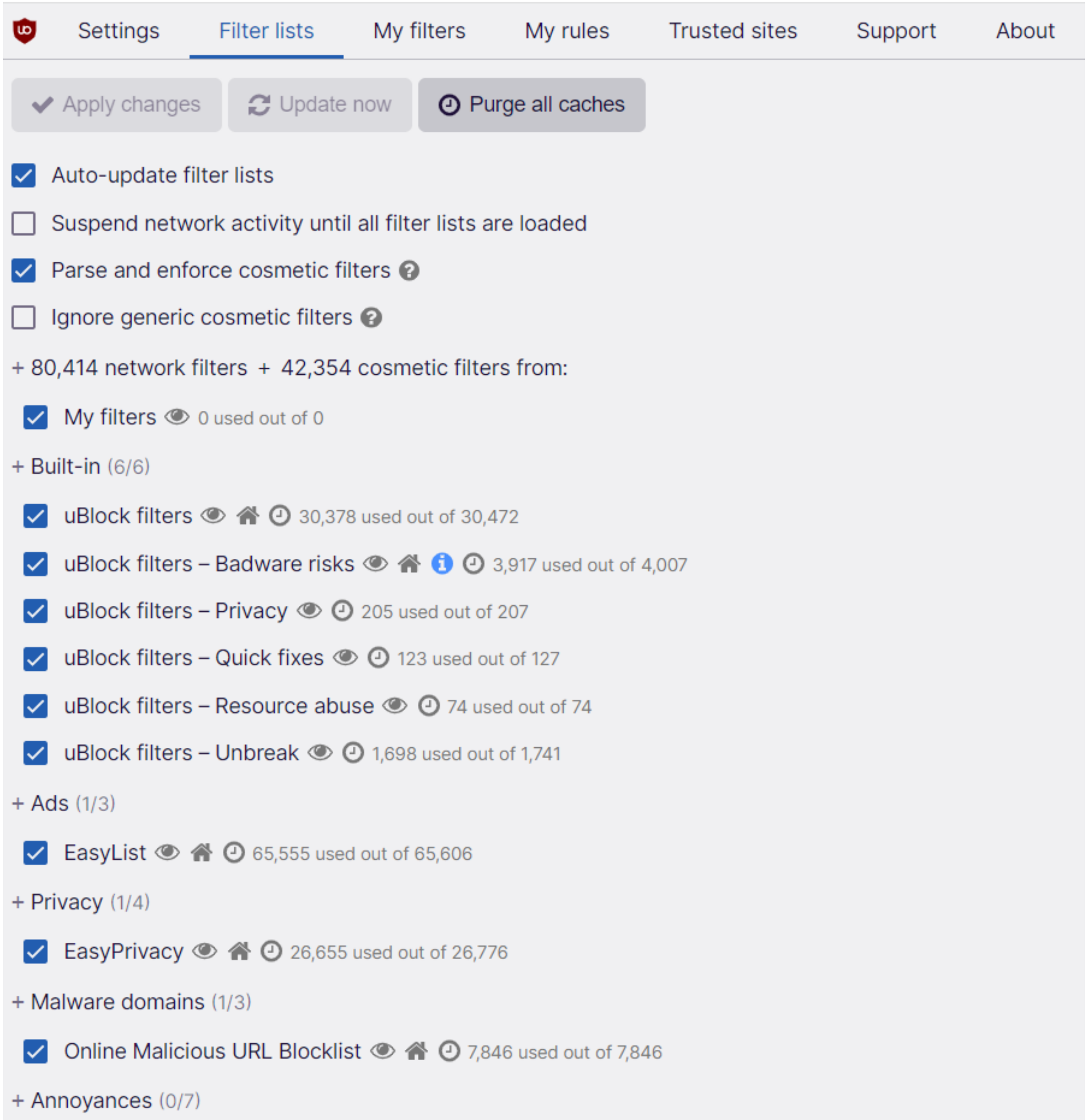
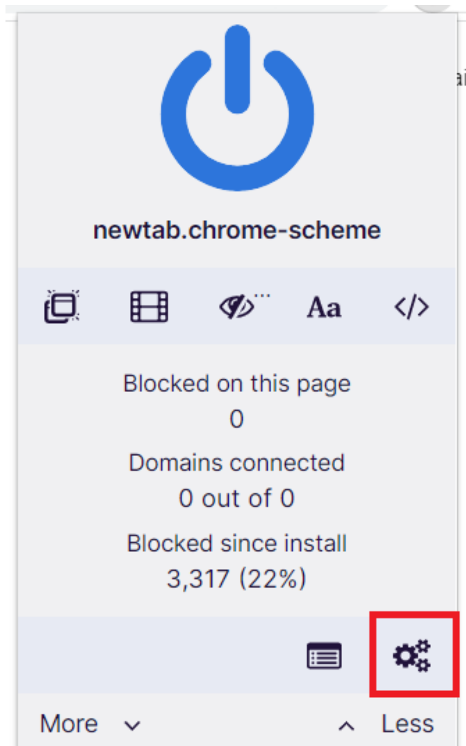


Figure 49
Accessing uBlock Settings



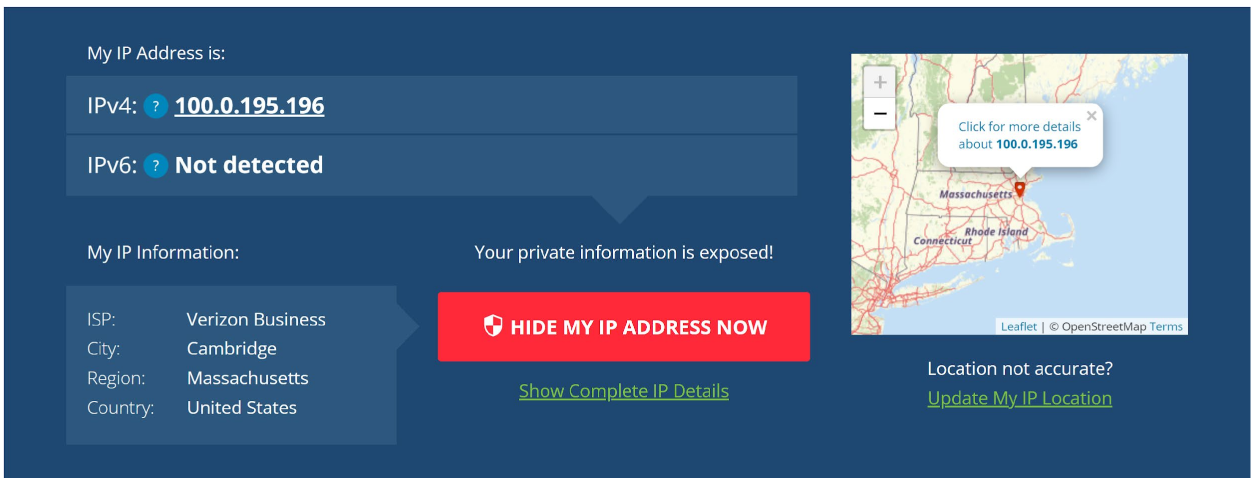
141. My tests demonstrate that extensions that aim at preventing data transmissions related to advertising are effective tools that may limit certain transmissions to Google-associated domains.

5. VPN Services Mask Users' IP Addresses

142. As discussed in **Section IV.A**, VPN services can be used for many reasons such as masking (i.e., replacing) the user's IP address with that of the VPN server, encrypting the communications of the user's device, or for bypassing geographic restrictions on content (e.g., if certain content is not available in a country where a user is located, they might use a VPN with an IP address associated with a different geographic region to gain access to that content).

143. To illustrate that VPN services are an effective tool to mask users' IP addresses, I accessed a website that shows IP addresses with and without VPN services enabled while in Private Browsing Mode. First, I observed an IP address of the test machine by navigating to *https://whatismyipaddress.com/service* without having enabled a VPN service. **Figure 50** illustrates the IP address. Because IP addresses can be used to approximate a geographic location, this **Figure** shows that my location at the time of conducting this test was in Massachusetts, United States.

Figure 50
Illustration of Actual External IP address

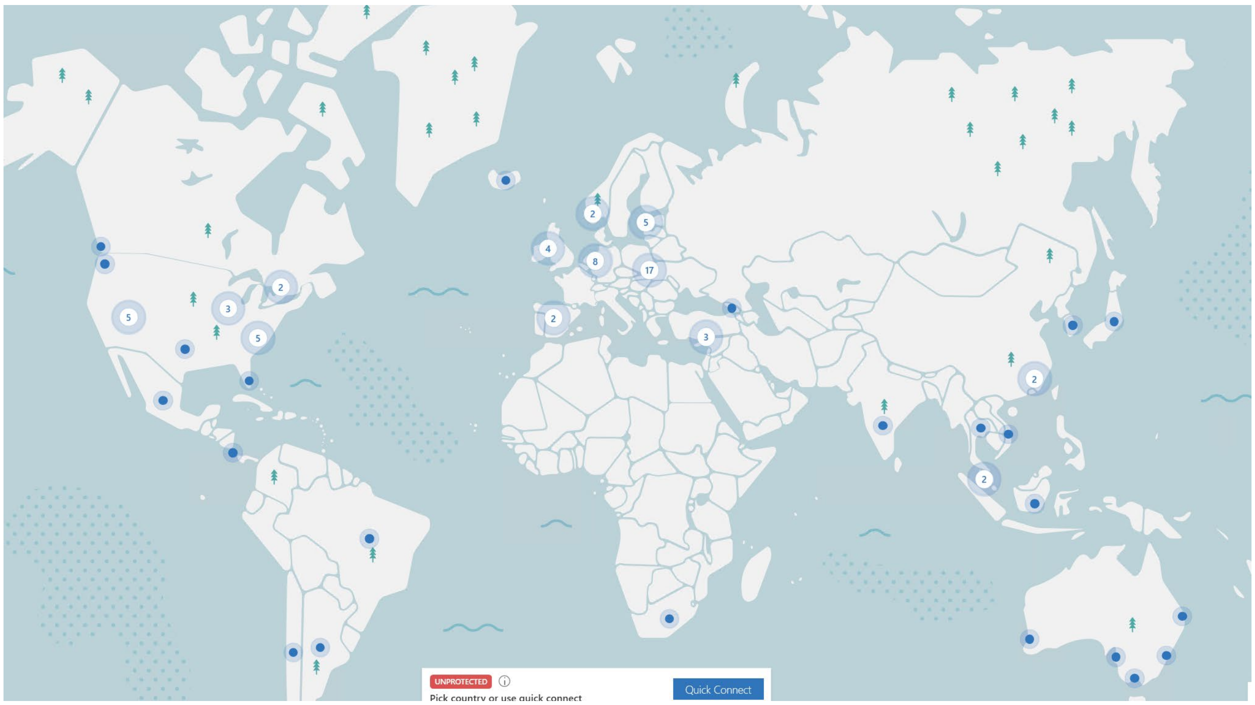


144. I then used NordVPN, which is a popular VPN service. The desktop application of NordVPN replaces the external IP address not only for browsing purposes but also generally for any communication over the Internet. NordVPN is available on many platforms including Windows, iOS, macOS, and Android.[162]

[162] "Download NordVPN app for Windows PC," *NordVPN*, available at https://nordvpn.com/download/windows/.

145. NordVPN, similarly to other VPN services, has a network of VPN servers around the world that allow users to change where they wish to have their VPN IP "be located". **Figure 51** illustrates the map of countries which a NordVPN user can choose from denoted by circled numbers or blue dots.[163]

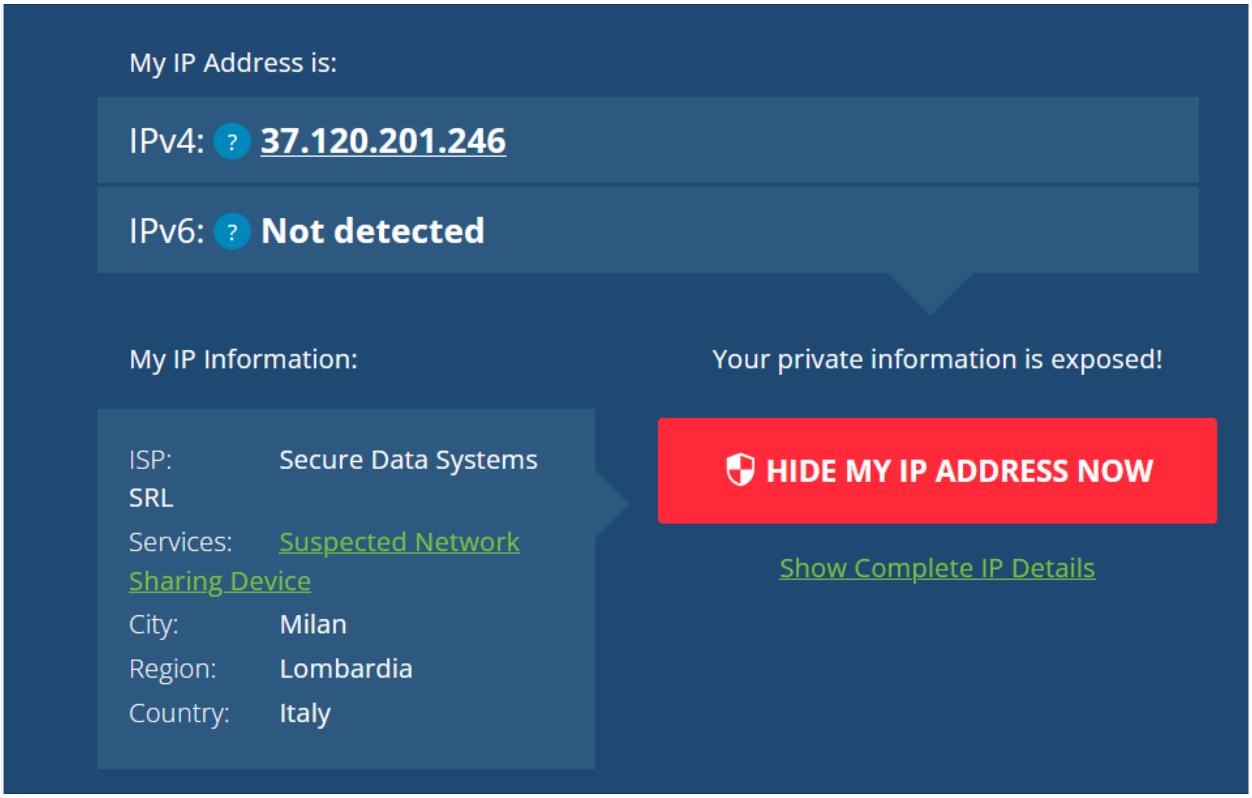
Figure 51
Country Options for IP Address in NordVPN Application



146. I selected Italy as a country of my IP destination and visited *https://whatismyipaddress.com/* again. As **Figure 52** shows, the service detected an IP address now located in Italy, which confirms that VPN services allow users to select an IP address associated with a different device and geographical area.

[163] There are many servers located in each represented country. It allows users to not only select a country but also a location or a server inside a country.

Figure 52
IP Address with VPN Use



147. My tests demonstrate that VPN services are an effective tool to mask users' IP addresses and would prevent the user's true IP address from being sent in transmissions to Google-associated domains.

Signed on the 15th day of April, 2022, at Brookline, MA.

Georgios Zervas

Exhibit 1.1: Comparison of Cookie Values Transmitted to Google Domains
Browsers Tested on Windows 10
https://www.nytimes.com/ (Part 1)

	Chrome				
Cookie Name	**Regular Mode (Initial Session)**	**Regular Mode (Session 1)**	**Private Browsing Mode (Session 1)**	**Private Browsing Mode (Session 2)**	**Regular Mode (Session 2)**
CMID	Yks9Y.SWIUDA.aPxaxuzcwAA				
DSID	NO_DATA	NO_DATA	NO_DATA		NO_DATA
ID	4a6ec1651f2677fb01344e9b7922b5				
IDE	AHWqTUkoq2dX3NoxwRtTab-zSG35qq	AHWqTUkoq2dX3NoxwRtTab-zSG35qq			AHWqTUkoq2dX3NoxwRtTab-zSG35qq
NID	511=cQIn3wCGiq3VdDmUobp8Q4u4tJ	511=cQIn3wCGiq3VdDmUobp8Q4u4tJ 511=eQ1j2bH0KvR_e62lB7-u7SBcp7			511=eQ1j2bH0KvR_e62lB7-u7SBcp7
TDID	275837f2-b26d-4845-9eb0-30a820				
__gads		***ID=4938b38a824c7925:T=16490980***	***ID=e54e47e3f11c2720-227caa17ed***	***ID=34671794ba3272dc-2269826e19***	***ID=4938b38a824c7925:T=16490980***
__gpi			***UID=000003b279b401f0:T=1649098***		
_ga	***1835220652.1649098083***	***1835220652.1649098083***	***1638073241.1649098353***	***257801265.1649098499***	***1835220652.1649098083***
_gcl_au	***885089998.1649098084***	***885089998.1649098084***	***1863613158.1649098355***	***696086320.1649098501***	***885089998.1649098084***
_gid	***2121132959.1649098084***	***2121132959.1649098084***	***1956093198.1649098355***	***990005167.1649098501***	***2121132959.1649098084***
_rxuuid	AYg5qPL1EljYkiXQ4sY5ZiD8sia0hG				
nyt-a	***XEdGEKPloF_lOs-E8lWqWR***	***XEdGEKPloF_lOs-E8lWqWR***	***ehP5FH2EknnaiSTeRQ6ik7***	***I6qhfsOaq7E4HVkMlHY-4O***	***XEdGEKPloF_lOs-E8lWqWR***
nyt-jkidd	***anon***	***anon***	***anon***	***anon***	***anon***
test_cookie	CheckForPermission				

Notes:
[1] Only the first 30 characters of a cookie value or URL parameter sent to Google-associated domains are displayed. The full value is included in file "os_full_value.xlsx" of the backup production.
[2] ***Bold, italicized*** cookie names and values denote first-party cookies.
[3] The Google-associated domain that each cookie value is sent is included in file "os_sent_domains.xlsx" of the backup production.
[4] The nyt-jkidd cookie is a first-party cookie with a long value. I observed a substring value of this long value, "anon", which matches a URL parameter sent to www.google-analytics.com. Since my exhibit shows only the substring value that was sent to Google-associated domains, I reviewed the full nyt-jkidd values across Regular and Private Browsing Mode and found that the values associated with the Private Browsing Mode were always different.
[5] Details on certain cookie values transmitted to Google-associated domains are noted in Appendix F.

Source:
[1] Network transmission data.

Exhibit 1.1: Comparison of Cookie Values Transmitted to Google Domains
Browsers Tested on Windows 10
https://www.nytimes.com/ (Part 2)

	Edge				
Cookie Name	**Regular Mode (Initial Session)**	**Regular Mode (Session 1)**	**Private Browsing Mode (Session 1)**	**Private Browsing Mode (Session 2)**	**Regular Mode (Session 2)**
__gads	***ID=1bc638bb52f6726e-22feb323ff***	***ID=1bc638bb52f6726e-22feb323ff***	***ID=b3e99924fd921ef6-22a4d6edfd***	***ID=fe420d50499a8f2d-22a5445cfc***	***ID=1bc638bb52f6726e-22feb323ff***
_ga	***1980542796.1649463052***	***1980542796.1649463052***	***1552015100.1649463349***	***1870558466.1649463497***	***1980542796.1649463052***
_gcl_au	***541175046.1649463053***	***541175046.1649463053***	***1630133533.1649463349***	***293630192.1649463497***	***541175046.1649463053***
_gid	***2146859059.1649463053***	***2146859059.1649463053***	***205049718.1649463350***	***1674661127.1649463497***	***2146859059.1649463053***
nyt-a	***6PO-6nit6_GBAXzfYx2PMC***	***6PO-6nit6_GBAXzfYx2PMC***	***8IdoLsIImk62tQX0AExbTy***	***ckC0z3y6Xy9SvjpatIwr97***	***6PO-6nit6_GBAXzfYx2PMC***
nyt-jkidd	***anon***	***anon***	***anon***	***anon***	***anon***

	Firefox				
Cookie Name	**Regular Mode (Initial Session)**	**Regular Mode (Session 1)**	**Private Browsing Mode (Session 1)**	**Private Browsing Mode (Session 2)**	**Regular Mode (Session 2)**
NID	511=ag1AD-6jNa_fOekuMR94fApuxT	511=ag1AD-6jNa_fOekuMR94fApuxT	511=Wuzrn5Y9zfOvixbDnErBJQM-mU	511=tt4Zr3DvRoZZS7fWxpqXmQbSK2	511=ag1AD-6jNa_fOekuMR94fApuxT
OTZ	6452731_56_56__56_	6452731_56_56__56_	6452734_56_56__56_	6452735_56_56__56_	6452731_56_56__56_
TDID					c3d20942-99c9-4190-b86f-236d2f
					ID=ce039df8d1ffc580:T=16494678
__gads	***ID=ce039df8d1ffc580:T=16494678***	***ID=ce039df8d1ffc580:T=16494678***			***ID=ce039df8d1ffc580-226cd95afc***
_ga	***1719483127.1649467862***	***1719483127.1649467862***			***1719483127.1649467862***
_gcl_au	***541199004.1649467861***	***541199004.1649467861***			***541199004.1649467861***
_gid	***2115386837.1649467862***	***2115386837.1649467862***			***2115386837.1649467862***
nyt-a	***DqtxykWB4vCfOzPtJCpBht***	***DqtxykWB4vCfOzPtJCpBht***			***DqtxykWB4vCfOzPtJCpBht***
nyt-jkidd	***anon***	***anon***			***anon***

Notes:
[1] Only the first 30 characters of a cookie value or URL parameter sent to Google-associated domains are displayed. The full value is included in file "os_full_value.xlsx" of the backup production.
[2] ***Bold, italicized*** cookie names and values denote first-party cookies.
[3] The Google-associated domain that each cookie value is sent is included in file "os_sent_domains.xlsx" of the backup production.
[4] The nyt-jkidd cookie is a first-party cookie with a long value. I observed a substring value of this long value, "anon", which matches a URL parameter sent to www.google-analytics.com. Since my exhibit shows only the substring value that was sent to Google-associated domains, I reviewed the full nyt-jkidd values across Regular and Private Browsing Mode and found that the values associated with the Private Browsing Mode were always different.
[5] Details on certain cookie values transmitted to Google-associated domains are noted in Appendix F.

Source:
[1] Network transmission data.

Exhibit 1.2: Comparison of Cookie Values Transmitted to Google Domains
Browsers Tested on Windows 10
https://www.apartments.com/

	Chrome				
Cookie Name	**Regular Mode (Initial Session)**	**Regular Mode (Session 1)**	**Private Browsing Mode (Session 1)**	**Private Browsing Mode (Session 2)**	**Regular Mode (Session 2)**
IDE	AHWqTUkVCdi9Unh_6axnSrQRHf9e3-	AHWqTUkVCdi9Unh_6axnSrQRHf9e3-			AHWqTUkVCdi9Unh_6axnSrQRHf9e3-
TDID	c95f593d-78d1-44f3-86c7-925b2d				
_ga	***741820916.1649093540***	***741820916.1649093540***	***1654030093.1649093665***	***1113805356.1649093720***	***741820916.1649093540***
_gcl_au	***1275291120.1649093540***	***1275291120.1649093540***	***122495526.1649093665***	***579581357.1649093720***	***1275291120.1649093540***
_gid	***369248429.1649093540***	***369248429.1649093540***	***296377553.1649093665***	***708541216.1649093720***	***369248429.1649093540***
test_cookie	CheckForPermission				

	Edge				
Cookie Name	**Regular Mode (Initial Session)**	**Regular Mode (Session 1)**	**Private Browsing Mode (Session 1)**	**Private Browsing Mode (Session 2)**	**Regular Mode (Session 2)**
_ga	***597464165.1649623202***	***597464165.1649623202***	***1256957579.1649623368***	***922922173.1649623431***	***597464165.1649623202***
_gcl_au	***222147690.1649623202***	***222147690.1649623202***	***261178691.1649623368***	***1968876362.1649623431***	***222147690.1649623202***
_gid	***796645681.1649623202***	***796645681.1649623202***	***753400918.1649623368***	***240078578.1649623431***	***796645681.1649623202***

	Firefox				
Cookie Name	**Regular Mode (Initial Session)**	**Regular Mode (Session 1)**	**Private Browsing Mode (Session 1)**	**Private Browsing Mode (Session 2)**	**Regular Mode (Session 2)**
_ga	***677770063.1649465050***	***677770063.1649465050***			***677770063.1649465050***
_gcl_au	***1879048979.1649465050***	***1879048979.1649465050***			***1879048979.1649465050***
_gid	***1926130038.1649465050***	***1926130038.1649465050***			***1926130038.1649465050***
_sctr	***1649462400000***	***1649462400000***			***1649462400000***

Notes:
[1] Only the first 30 characters of a cookie value or URL parameter sent to Google-associated domains are displayed. The full value is included in file “os_full_value.xlsx” of the backup production.
[2] ***Bold, italicized*** cookie names and values denote first-party cookies.
[3] The Google-associated domain that each cookie value is sent is included in file “os_sent_domains.xlsx” of the backup production.
[4] Details on certain cookie values transmitted to Google-associated domains are noted in Appendix F.

Source:
[1] Network transmission data.

Exhibit 1.3: Comparison of Cookie Values Transmitted to Google Domains
Browsers Tested on Windows 10
https://www.cnn.com/ (Part 1)

	Chrome				
Cookie Name	**Regular Mode (Initial Session)**	**Regular Mode (Session 1)**	**Private Browsing Mode (Session 1)**	**Private Browsing Mode (Session 2)**	**Regular Mode (Session 2)**
CMID	YksuFMusio6QBKUnOattzgAA				YksuFMusio6QBKUnOattzgAA
DSID	NO_DATA	NO_DATA			NO_DATA
IDE	AHWqTUnMeZmUfdziMkbQah0KMNdxbs AHWqTUl2XhJlmw74VfJg3g-N3EjYND	AHWqTUl2XhJlmw74VfJg3g-N3EjYND			AHWqTUl2XhJlmw74VfJg3g-N3EjYND
TDID	3ea37b7d-4212-420b-96ee-6cd385				
V	gEn2iwNwRQ1v			oy8L2Hh9RuXf s2tKHPyHOy7X	
__106_cid	3ea37b7d-4212-420b-96ee-6cd385				
__gads		***ID=2e3b16973ad1c208:T=16490941***	***ID=e9906127e1685e9b-22fc8bb7ed***	***ID=b731f294f0bcf29c-22a54dfbec***	***ID=2e3b16973ad1c208:T=16490941***
__io_cid	3ea37b7d-4212-420b-96ee-6cd385				
kuid		Owjms0IS			Owjms0IS
indxexcg	YksuFMusio6QBKUnOattzgAAA54AAA				YksuFMusio6QBKUnOattzgAAA54AAA
ljt_reader	201961fbd447ea19e3977301				
ptrpp	gEn2iwNwRQ1v				
ptrstk	h88zR_LZR3VeoalZQjghhBTnUu4				
ptrt	3ea37b7d-4212-420b-96ee-6cd385				
test_cookie	CheckForPermission				
ttd	3ea37b7d-4212-420b-96ee-6cd385				
ug	***624b2e110106ca0a3f9083001438a3***	***624b2e110106ca0a3f9083001438a3***	***624b303f0ee9f40a3f9b5b00173ae8***	***624b3108015bb90a3f85a100151760***	***624b2e110106ca0a3f9083001438a3***
ug1	***624b2e110106ca0a3f9083001438a3***		***624b303f0ee9f40a3f9b5b00173ae8***	***624b3108015bb90a3f85a100151760***	

Notes:
[1] Only the first 30 characters of a cookie value or URL parameter sent to Google-associated domains are displayed. The full value is included in file "os_full_value.xlsx" of the backup production.
[2] ***Bold, italicized*** cookie names and values denote first-party cookies.
[3] The Google-associated domain that each cookie value is sent is included in file "os_sent_domains.xlsx" of the backup production.
[4] Cookie "ug1" is set by www.ugdturner.com, which appears to be part of Turner Broadcasting System, Inc., the owner of CNN.
[5] Details on certain cookie values transmitted to Google-associated domains are noted in Appendix F.

Source:
[1] Network transmission data.

CONFIDENTIAL – SUBJECT TO PROTECTIVE ORDER

Exhibit 1.3: Comparison of Cookie Values Transmitted to Google Domains
Browsers Tested on Windows 10
https://www.cnn.com/ (Part 2)

	Edge				
Cookie Name	**Regular Mode (Initial Session)**	**Regular Mode (Session 1)**	**Private Browsing Mode (Session 1)**	**Private Browsing Mode (Session 2)**	**Regular Mode (Session 2)**
__gads	***ID=8cc9ee5e237302cc-222e2b5cff***	***ID=8cc9ee5e237302cc-222e2b5cff*** ***ID=8cc9ee5e237302cc:T=16495634***	***ID=af22eb073c41cd68-22ca0d9126***	***ID=2190aa990814fbc6:T=16495640***	***ID=8cc9ee5e237302cc:T=16495634***
ug	***6252570b04dcd30a3f8d7c0015f782***	***6252570b04dcd30a3f8d7c0015f782***	***625258b50aaf3f0a3f908300169892***	***625259610a98670a3f85a1001610b1***	***6252570b04dcd30a3f8d7c0015f782***
ug1	***6252570b04dcd30a3f8d7c0015f782***		***625258b50aaf3f0a3f908300169892***	***625259610a98670a3f85a1001610b1***	

	Firefox				
Cookie Name	**Regular Mode (Initial Session)**	**Regular Mode (Session 1)**	**Private Browsing Mode (Session 1)**	**Private Browsing Mode (Session 2)**	**Regular Mode (Session 2)**
DSID		NO_DATA			NO_DATA
__gads	***ID=306369aa2bdc333a-22fd95db25***	***ID=306369aa2bdc333a-22fd95db25***			***ID=306369aa2bdc333a-22fd95db25***
dc_id	4d20a2b4851a4e81adf37e57e0bb3b				
ug	***6250d8e207fab30a3f8d7c0016cc55***	***6250d8e207fab30a3f8d7c0016cc55***			***6250d8e207fab30a3f8d7c0016cc55***
ug1	***6250d8e207fab30a3f8d7c0016cc55***				
uuid	***41ab32316e714eb5b9d5971624d816***				

Notes:
[1] Only the first 30 characters of a cookie value or URL parameter sent to Google-associated domains are displayed. The full value is included in file "os_full_value.xlsx" of the backup production.
[2] ***Bold, italicized*** cookie names and values denote first-party cookies.
[3] The Google-associated domain that each cookie value is sent is included in file "os_sent_domains.xlsx" of the backup production.
[4] Cookie "ug1" is set by www.ugdturner.com, which appears to be part of Turner Broadcasting System, Inc., the owner of CNN.
[5] Details on certain cookie values transmitted to Google-associated domains are noted in Appendix F.

Source:
[1] Network transmission data.

Exhibit 1.4: Comparison of Cookie Values Transmitted to Google Domains
Browsers Tested on Windows 10
https://www.latimes.com/ (Part 1)

	Chrome				
Cookie Name	**Regular Mode (Initial Session)**	**Regular Mode (Session 1)**	**Private Browsing Mode (Session 1)**	**Private Browsing Mode (Session 2)**	**Regular Mode (Session 2)**
CMID	YksztUu5-Odb-876ih.opAAA				
DSID		NO_DATA	NO_DATA		NO_DATA
IDE	AHWqTUmcZ4r4YEBqWCvorm8RnYFn6W	AHWqTUmcZ4r4YEBqWCvorm8RnYFn6W			AHWqTUmcZ4r4YEBqWCvorm8RnYFn6W
TDID	91e01a4e-542d-4f70-9812-b3cd8d				
__gads	***ID=12900160c988ae12-22c463b0ed*** ***ID=12900160c988ae12:T=16490956***	***ID=12900160c988ae12:T=16490956***	***ID=ed6accefacec9948-220735e8ec*** ***ID=ed6accefacec9948:T=16490960***	***ID=b254a586fbefdcad-22f262bbee*** ***ID=b254a586fbefdcad:T=16490961***	***ID=12900160c988ae12:T=16490956***
_ga	***1046244586.1649095605***	***1046244586.1649095605***	***1929415882.1649096015***	***1999179419.1649096141***	***1046244586.1649095605***
_gid	***1006204224.1649095605***	***1006204224.1649095605***	***474539410.1649096016***	***1180894715.1649096141***	***1006204224.1649095605***
_rxuuid	AYg5qPIDmGplemylkpuuFdUXC2A22G AYg5qPJspe23BEbQlsw7vMJ43T-3n3				
b		624B34A614A89BDE61DB6890BLIS			
google_push					AYg5qPJY2vLmrxrlifd36PjW3JFUvw AYg5qPJJ9vkOO6TeIozhCP6HckoF24
ljt_reader		7d01d1656cdbc95b772b714e			
permutive-id		***704a7fad-03c4-4a2e-b43a-8ed374***	***5cca0f8d-5f26-4392-917f-8f9054***	***84293d41-a539-44ee-a7d7-641dfd***	***704a7fad-03c4-4a2e-b43a-8ed374***
sa-user-id-v2	RSX1qNzrTglvDZC9K8PwIhTnUu4				RSX1qNzrTglvDZC9K8PwIhTnUu4
ssh	triplelift				
suid		8E1BE579BCC7492FB56128D60FA4C5			
suid_legacy		8E1BE579BCC7492FB56128D60FA4C5			
test_cookie	CheckForPermission				
uuid	***d1da6296-a849-4e07-a320-38946e***	***d1da6296-a849-4e07-a320-38946e***	***2b59a04a-8894-45a0-b684-4fab66***	***a961437b-ad51-4b42-848a-1b5c88***	***d1da6296-a849-4e07-a320-38946e***

Notes:
[1] Only the first 30 characters of a cookie value or URL parameter sent to Google-associated domains are displayed. The full value is included in file "os_full_value.xlsx" of the backup production.
[2] ***Bold, italicized*** cookie names and values denote first-party cookies.
[3] The Google-associated domain that each cookie value is sent is included in file "os_sent_domains.xlsx" of the backup production.
[4] Details on certain cookie values transmitted to Google-associated domains are noted in Appendix F.

Source:
[1] Network transmission data.

Exhibit 1.4: Comparison of Cookie Values Transmitted to Google Domains
Browsers Tested on Windows 10
https://www.latimes.com/ (Part 2)

	Edge				
Cookie Name	**Regular Mode (Initial Session)**	**Regular Mode (Session 1)**	**Private Browsing Mode (Session 1)**	**Private Browsing Mode (Session 2)**	**Regular Mode (Session 2)**
DSID	NO_DATA	NO_DATA	NO_DATA	NO_DATA	NO_DATA
__gads	***ID=905b2d82ddaaadac-224952effd***	***ID=905b2d82ddaaadac:T=16494621***	***ID=24b544a1662565d0-2235c83efc***	***ID=71c1f237eb803732-22af934fff***	***ID=905b2d82ddaaadac:T=16494621***
_ga	***1200003065.1649462122***	***1200003065.1649462122***	***1638692517.1649462394***	***1104984448.1649462516***	***1200003065.1649462122***
_gid	***352573928.1649462122***	***352573928.1649462122***	***1329120513.1649462394***	***792753936.1649462516***	***352573928.1649462122***
_sctr				***1649462400000***	
permutive-id		***4e26ce71-d419-4008-926c-6be891***	***d42ae05d-b1ab-4cdc-9f48-4a017e***	***49afd594-c2d9-4dc0-9cc0-5f5af2***	***4e26ce71-d419-4008-926c-6be891***
uuid	***9eecb0d2-3a70-4aa2-bc40-641373***	***9eecb0d2-3a70-4aa2-bc40-641373***	***cf36c165-5762-4404-9200-726283***	***c1357280-9545-45c8-8fdf-3f655e***	***9eecb0d2-3a70-4aa2-bc40-641373***

	Firefox				
Cookie Name	**Regular Mode (Initial Session)**	**Regular Mode (Session 1)**	**Private Browsing Mode (Session 1)**	**Private Browsing Mode (Session 2)**	**Regular Mode (Session 2)**
DSID	NO_DATA				
__gads	***ID=abbc5452537fcadb-22ef4d47fd***	***ID=abbc5452537fcadb:T=16494673***			***ID=abbc5452537fcadb:T=16494673***
_ga	***1909485602.1649467321***	***1909485602.1649467321***			***1909485602.1649467321***
_gid	***1568002468.1649467321***				***1568002468.1649467321***
permutive-id	***6a13c7ed-b525-403f-babd-920943***	***6a13c7ed-b525-403f-babd-920943***			***6a13c7ed-b525-403f-babd-920943***
uuid	***c0aa635c-4bc8-4a5c-9b11-c60e78***	***c0aa635c-4bc8-4a5c-9b11-c60e78***			***c0aa635c-4bc8-4a5c-9b11-c60e78***

Notes:
[1] Only the first 30 characters of a cookie value or URL parameter sent to Google-associated domains are displayed. The full value is included in file "os_full_value.xlsx" of the backup production.
[2] ***Bold, italicized*** cookie names and values denote first-party cookies.
[3] The Google-associated domain that each cookie value is sent is included in file "os_sent_domains.xlsx" of the backup production.
[4] Details on certain cookie values transmitted to Google-associated domains are noted in Appendix F.

Source:
[1] Network transmission data.

Exhibit 1.5: Comparison of Cookie Values Transmitted to Google Domains
Browsers Tested on Windows 10
https://www.washingtonpost.com/ (Part 1)

	Chrome				
Cookie Name	**Regular Mode (Initial Session)**	**Regular Mode (Session 1)**	**Private Browsing Mode (Session 1)**	**Private Browsing Mode (Session 2)**	**Regular Mode (Session 2)**
CMID	YktAw08aiLE0oOKr7xJYYAAA				
DSID	NO_DATA	NO_DATA	NO_DATA		NO_DATA
IDE	AHWqTUkE9eVNy1cRjx1K27ctAumt7I	AHWqTUkE9eVNy1cRjx1K27ctAumt7I			AHWqTUkE9eVNy1cRjx1K27ctAumt7I
SCM	82c54452				
SCMg	82c54452				
__gads	***ID=9a82f095d4dbd4cb-22ffab57ed ID=9a82f095d4dbd4cb:T=16490989***	***ID=9a82f095d4dbd4cb:T=16490989***	***ID=4379d0eb84f9f8ed-222cfaefed***	***ID=90bd2ac36f34153a-22a68620ed***	***ID=9a82f095d4dbd4cb:T=16490989***
_ga	***25199709.1649098946***	***25199709.1649098946***	***973215853.1649099124***	***1211309450.1649099213***	***25199709.1649098946***
_ga_WRCN6 8Y2LD	***1649098945***	***1649099065***	***1649099123***	***1649099212***	***1649099297***
_gaexp	***3gY8TfBUQy645wcR55Xl0w.1***	***3gY8TfBUQy645wcR55Xl0w.1***	***3gY8TfBUQy645wcR55Xl0w.1***	***3gY8TfBUQy645wcR55Xl0w.1***	***3gY8TfBUQy645wcR55Xl0w.1***
_gid	***1090736128.1649098946***	***1090736128.1649098946***	***1771791117.1649099124***	***1380715884.1649099213***	***1090736128.1649098946***
suid	912FE61A0F9B4BD187DF04AF759C4E				
suid_legacy	912FE61A0F9B4BD187DF04AF759C4E				
test_cookie	CheckForPermission				
wp_ak_subs	0|20220331		0|20220331	0|20220331	
wp_ak_v_m	***0|20220331***	***0|20220331***	***0|20220331***	***0|20220331***	***0|20220331***
wp_geo	***US|VA|511||***	***US|VA|511||***	***US|VA|511||***	***US|VA|511||***	***US|VA|511||***
wp_usp	***1---***	***1---***	***1---***	***1---***	***1---***

Notes:
[1] Only the first 30 characters of a cookie value or URL parameter sent to Google-associated domains are displayed. The full value is included in file “os_full_value.xlsx” of the backup production.
[2] ***Bold, italicized*** cookie names and values denote first-party cookies.
[3] The Google-associated domain that each cookie value is sent is included in file “os_sent_domains.xlsx” of the backup production.
[4] Details on certain cookie values transmitted to Google-associated domains are noted in Appendix F.

Source:
[1] Network transmission data.

Exhibit 1.5: Comparison of Cookie Values Transmitted to Google Domains
Browsers Tested on Windows 10
https://www.washingtonpost.com/ (Part 2)

	Edge				
Cookie Name	**Regular Mode (Initial Session)**	**Regular Mode (Session 1)**	**Private Browsing Mode (Session 1)**	**Private Browsing Mode (Session 2)**	**Regular Mode (Session 2)**
DSID		NO_DATA			
__gads	***ID=3b2e5a84ab44c87a-22a4c754fd***	***ID=3b2e5a84ab44c87a-22a4c754fd*** ***ID=3b2e5a84ab44c87a:T=16494613***	***ID=f1285943f0100d75-2213bf41fd***	***ID=7cf6e7dadb5e075b:T=16494616*** ***ID=7cf6e7dadb5e075b-220943b7fd***	***ID=3b2e5a84ab44c87a-227f3e73fc*** ***ID=3b2e5a84ab44c87a:T=16494613***
_ga	***899250726.1649461337***	***899250726.1649461337***	***1826560173.1649461556***	***52084918.1649461642***	***899250726.1649461337***
_ga_WRCN6 8Y2LD	***1649461336***	***1649461466***	***1649461555***	***1649461641***	***1649461727***
_gaexp	***3gY8TfBUQy645wcR55Xl0w.0***	***3gY8TfBUQy645wcR55Xl0w.0***	***3gY8TfBUQy645wcR55Xl0w.0***	***3gY8TfBUQy645wcR55Xl0w.0***	***3gY8TfBUQy645wcR55Xl0w.0***
_gid	***645015223.1649461337***	***645015223.1649461337***	***223744946.1649461556***	***1645226885.1649461642***	***645015223.1649461337***
wp_ak_subs	0|20220331			0|20220331	
wp_ak_v_m	***0|20220331***	***0|20220331***	***1|20220331***	***0|20220331***	***0|20220331***
wp_geo	***US|VA|560||***	***US|VA|560||***	***US|VA|560||***	***US|VA|560||***	***US|VA|560||***
wp_usp	***1---***	***1---***	***1---***	***1---***	***1---***

	Firefox				
Cookie Name	**Regular Mode (Initial Session)**	**Regular Mode (Session 1)**	**Private Browsing Mode (Session 1)**	**Private Browsing Mode (Session 2)**	**Regular Mode (Session 2)**
__gads	***ID=d1aaade5c37056ee-222b6c40ff***	***ID=d1aaade5c37056ee-222b6c40ff***			***ID=d1aaade5c37056ee-222b6c40ff***
_ga	***1643073982.1649466845***	***1643073982.1649466845***			***1643073982.1649466845***
_ga_WRCN6 8Y2LD	***1649466847***	***1649466908***			***1649467049***
_gaexp	***3gY8TfBUQy645wcR55Xl0w.1***	***3gY8TfBUQy645wcR55Xl0w.1***			***3gY8TfBUQy645wcR55Xl0w.1***
_gid	***222965876.1649466850***	***222965876.1649466850***			***222965876.1649466850***
wp_ak_subs	0|20220331				
wp_ak_v_m	***0|20220331***	***0|20220331***			***0|20220331***
wp_geo	***US|VA|560||***	***US|VA|560||***			***US|VA|560||***
wp_usp	***1---***	***1---***			***1---***

Notes:
[1] Only the first 30 characters of a cookie value or URL parameter sent to Google-associated domains are displayed. The full value is included in file "os_full_value.xlsx" of the backup production.
[2] ***Bold, italicized*** cookie names and values denote first-party cookies.
[3] The Google-associated domain that each cookie value is sent is included in file "os_sent_domains.xlsx" of the backup production.
[4] Details on certain cookie values transmitted to Google-associated domains are noted in Appendix F.

Source:
[1] Network transmission data.

Exhibit 1.6: Comparison of Cookie Values Transmitted to Google Domains
Browsers Tested on MacOS
https://www.nytimes.com/

	Chrome				
Cookie Name	**Regular Mode (Initial Session)**	**Regular Mode (Session 1)**	**Private Browsing Mode (Session 1)**	**Private Browsing Mode (Session 2)**	**Regular Mode (Session 2)**
CMID	YlGnSQWw.AhehnyajMLFJgAA				YlGnSQWw.AhehnyajMLFJgAA
ID	41986b8187c383ad299652da8bd807				
IDE	AHWqTUk2pt1v4p3AvRJ8Bp4SMTag-N	AHWqTUk2pt1v4p3AvRJ8Bp4SMTag-N			AHWqTUk2pt1v4p3AvRJ8Bp4SMTag-N
NID	511=ErMhlTP5teg3H7UOTI1mh5YIY0 511=WQKwerudOJqJM3v-jDy_0qIbvX	511=WQKwerudOJqJM3v-jDy_0qIbvX			511=WQKwerudOJqJM3v-jDy_0qIbvX 511=fdF34QAqltTRsJZQfjudWSToti
TDID	c552f04c-8884-4b8d-9e62-ac6ce7		cc96810a-201c-48c3-a8c4-dfdbeb		
__gads	***ID=586c9d0bf19ce1db-22be9ad426*** ***ID=586c9d0bf19ce1db:T=16495184***	***ID=586c9d0bf19ce1db:T=16495184***	***ID=ef5550874ebe12b3-22241480ff***	***ID=8605b9dec37c6d98-220ec231ff***	***ID=586c9d0bf19ce1db:T=16495184***
_ga	***1364005265.1649518408***	***1364005265.1649518408***	***1166568481.1649518533***	***1449434366.1649518599***	***1364005265.1649518408***
_gcl_au	***1265247173.1649518411***	***1265247173.1649518411***	***179557806.1649518537***	***282959307.1649518602***	***1265247173.1649518411***
_gid	***881624777.1649518412***	***881624777.1649518412***	***1489659359.1649518538***	***1168375711.1649518602***	***881624777.1649518412***
nyt-a	***DtHEoMLfpp4tDTJTfaJDyW***	***DtHEoMLfpp4tDTJTfaJDyW***	***SNIq3lcyk8xh_M9L_-MIbl***	***_ScK56cMj9RW07j18KM-6o***	***DtHEoMLfpp4tDTJTfaJDyW***
nyt-jkidd	***anon***	***anon***	***anon***	***anon***	***anon***
test_cookie	CheckForPermission				
tv_UIDF	CAESENc-SVCHxILvB9mworPG_Es				

	Safari				
Cookie Name	**Regular Mode (Initial Session)**	**Regular Mode (Session 1)**	**Private Browsing Mode (Session 1)**	**Private Browsing Mode (Session 2)**	**Regular Mode (Session 2)**
__gads	***ID=61cbf7e5a03ed9d1-22a5ff75ff***	***ID=61cbf7e5a03ed9d1-22a5ff75ff***	***ID=9961355b5c845d22-22dff2bc26***	***ID=4a361d48129eac30-22736d1226***	***ID=61cbf7e5a03ed9d1-22a5ff75ff*** ***ID=61cbf7e5a03ed9d1-22a5ff75ff***
_ga	***876028807.1649473718***	***876028807.1649473718***	***789988728.1649473926***	***732824226.1649474003***	***876028807.1649473718***
_gcl_au	***1633697201.1649473720***	***1633697201.1649473720***	***1801524897.1649473926***	***1364278623.1649474004***	***1633697201.1649473720***
_gid	***1109884847.1649473723***	***1109884847.1649473723***	***1922564748.1649473927***	***1380442505.1649474005***	***1109884847.1649473723***
nyt-a	***GEVS5mJi1RQtDX4i5N_lyN***	***GEVS5mJi1RQtDX4i5N_lyN***	***L9IFlRHvIiFh9hc9zAyEJI***	***wZyIPuhxuCVAR1XrcCSOF-***	***GEVS5mJi1RQtDX4i5N_lyN***
nyt-jkidd	***anon***	***anon***	***anon***	***anon***	***anon***

Notes:
[1] Only the first 30 characters of a cookie value or URL parameter sent to Google-associated domains are displayed. The full value is included in file "os_full_value.xlsx" of the backup production.
[2] ***Bold, italicized*** cookie names and values denote first-party cookies.
[3] The Google-associated domain that each cookie value is sent is included in file "os_sent_domains.xlsx" of the backup production.
[4] The nyt-jkidd cookie is a first-party cookie with a long value. I observed a substring value of this long value, "anon", which matches a URL parameter sent to www.google-analytics.com. Since my exhibit shows only the substring value that was sent to Google-associated domains, I reviewed the full nyt-jkidd values across Regular and Private Browsing Mode and found that the values associated with the Private Browsing Mode were always different.
[5] Details on certain cookie values transmitted to Google-associated domains are noted in Appendix F.

Source:
[1] Network transmission data.

Exhibit 1.7: Comparison of Cookie Values Transmitted to Google Domains
Browsers Tested on MacOS
https://www.apartments.com/

	Chrome				
Cookie Name	**Regular Mode (Initial Session)**	**Regular Mode (Session 1)**	**Private Browsing Mode (Session 1)**	**Private Browsing Mode (Session 2)**	**Regular Mode (Session 2)**
IDE	AHWqTUkquDSpiaEWyojC2CXpXlpuCc	AHWqTUkquDSpiaEWyojC2CXpXlpuCc			AHWqTUkquDSpiaEWyojC2CXpXlpuCc
TDID		790583b5-ede2-4b06-9ade-959235			
_ga	***761064299.1649520844***	***761064299.1649520844***	***2041799495.1649520913***	***1375465460.1649520952***	***761064299.1649520844***
_gcl_au	***203245146.1649520845***	***203245146.1649520845***	***1932284121.1649520914***	***1894760233.1649520953***	***203245146.1649520845***
_gid	***295033893.1649520844***	***295033893.1649520844***	***683045336.1649520913***	***1679466380.1649520952***	***295033893.1649520844***
test_cookie	CheckForPermission				

	Safari				
Cookie Name	**Regular Mode (Initial Session)**	**Regular Mode (Session 1)**	**Private Browsing Mode (Session 1)**	**Private Browsing Mode (Session 2)**	**Regular Mode (Session 2)**
_ga	***1956423945.1649187733***	***1956423945.1649187733***	***56642298.1649187842***	***1353171259.1649187904***	***1956423945.1649187733***
_gcl_au	***1056780030.1649187734***	***1056780030.1649187734***	***36293318.1649187843***	***601872010.1649187904***	***1056780030.1649187734***
_gid	***200632100.1649187733***	***200632100.1649187733***	***1362391677.1649187842***	***407875132.1649187904***	***200632100.1649187733***

Notes:
[1] Only the first 30 characters of a cookie value or URL parameter sent to Google-associated domains are displayed. The full value is included in file "os_full_value.xlsx" of the backup production.
[2] ***Bold, italicized*** cookie names and values denote first-party cookies.
[3] The Google-associated domain that each cookie value is sent is included in file "os_sent_domains.xlsx" of the backup production.
[4] Details on certain cookie values transmitted to Google-associated domains are noted in Appendix F.

Source:
[1] Network transmission data.

Exhibit 1.8: Comparison of Cookie Values Transmitted to Google Domains
Browsers Tested on MacOS
https://www.cnn.com/

Chrome

Cookie Name	Regular Mode (Initial Session)	Regular Mode (Session 1)	Private Browsing Mode (Session 1)	Private Browsing Mode (Session 2)	Regular Mode (Session 2)
CMID	YlEShrVdZUvaVCTZUj.quwAA				
DSID		NO_DATA	NO_DATA	NO_DATA	NO_DATA
IDE	AHWqTUnu_Vx_CIcUivsBYH-ZT0Ml9n	AHWqTUnu_Vx_CIcUivsBYH-ZT0Ml9n			AHWqTUnu_Vx_CIcUivsBYH-ZT0Ml9n
KRTBCOOKIE_860					x9Mk56wkT758O4qVPXnTUWQAw8Q
SCM		554c6e2a			
SCM1001299		554c6e2a			
SCM1001609		554c6e2a			
SCMg		554c6e2a			
SCMo		554c6e2a			
SCMsas		554c6e2a			
SCMtmp1001299		554c6e2a			
SCMtmp1001609		554c6e2a			
TDID		9183d6d9-353f-4b4e-aa39-c56e9f			
V		ayiI00R9BRG2			
__106_cid		9183d6d9-353f-4b4e-aa39-c56e9f			
__gads	***ID=89fb9468ddae041d-22b71b50ff*** ***ID=89fb9468ddae041d:T=16494803***	***ID=89fb9468ddae041d:T=16494803***	***ID=3619eb5f9d30a432-22410a84fc***	***ID=0434968cb45b04fe-22d61af6fd***	***ID=89fb9468ddae041d:T=16494803***
__gpi	***UID=000003f241fafe1a:T=1649480***				
__io_cid		9183d6d9-353f-4b4e-aa39-c56e9f			
kuid		OxHkcpL1			OxHkcpL1
google_push		AYg5qPIVdXfevXD-wjPA3lqnyJC978			
indxexcg	YlEShrVdZUvaVCTZUj-quwAAA6kAAA	YlEShrVdZUvaVCTZUj-quwAAA6kAAA			YlEShrVdZUvaVCTZUj-quwAAA6kAAA
ljt_reader	a6b4c2dc8242500acbf177d6				
ptrpp		ayiI00R9BRG2			
ptrt		9183d6d9-353f-4b4e-aa39-c56e9f			
sa-user-id-v2					x9Mk56wkT758O4qVPXnTUWQAw8Q
smaato		554c6e2a			
suid		0E070E7EA1C54C9FA0F6405FCB040A			
test_cookie	CheckForPermission				
ttd		9183d6d9-353f-4b4e-aa39-c56e9f			
ug	***6251128806d11a0a3f8d7c0015e2d8***	***6251128806d11a0a3f8d7c0015e2d8***	***6251133603bc700a3f9b5b0019c2f6***	***6251138101670d0a3f85a100154115***	***6251128806d11a0a3f8d7c0015e2d8***
ug1	***6251128806d11a0a3f8d7c0015e2d8***		***6251133603bc700a3f9b5b0019c2f6***	***6251138101670d0a3f85a100154115***	

Safari

Cookie Name	Regular Mode (Initial Session)	Regular Mode (Session 1)	Private Browsing Mode (Session 1)	Private Browsing Mode (Session 2)	Regular Mode (Session 2)
DSID	NO_DATA	NO_DATA	NO_DATA	NO_DATA	NO_DATA
__gads	***ID=14254880f1ff44f6-22599d5600***	***ID=14254880f1ff44f6-22599d5600***	***ID=f9b37754d51d93d8-226f2c6ffc***	***ID=9a3ae2126314460e-223ee32fff***	***ID=14254880f1ff44f6-22599d5600*** ***ID=14254880f1ff44f6-22599d5600***
__gpi	***UID=000003f22783f069:T=1649472***				
dc_id	71525275afd247a6b1005d9b98d597	dc2e73e4ea5042fa9742be95eaaa6f	15c3328082814e29bd67e932bb8674	fe90cce0175d47fab5ce8004451b25	ad82a9f8b0d04ff1ba253cef37bc49
ug	***6250f2030954220a3f8d7c0015e0b9***	***6250f2030954220a3f8d7c0015e0b9***	***6250f2c006de5f0a3f908300156c77***	***6250f31f0e8bf90a3f8d7c0016ccd1***	***6250f2030954220a3f8d7c0015e0b9***
ug1	***6250f2030954220a3f8d7c0015e0b9***		***6250f2c006de5f0a3f908300156c77***	***6250f31f0e8bf90a3f8d7c0016ccd1***	
uuid	***759e7b245f7445f1abaf1dfd0a68cd***	***2a2a9fe8dd6b4bd88ee12b508ed763***	***bdc5f1c702dd406bad8f362214847d***	***fce404341bb146a6b37fbb606a2d30***	***a1144147f70348bcbb687857f2b195***

Notes:
[1] Only the first 30 characters of a cookie value or URL parameter sent to Google-associated domains are displayed. The full value is included in file "os_full_value.xlsx" of the backup production.
[2] ***Bold, italicized*** cookie names and values denote first-party cookies.
[3] The Google-associated domain that each cookie value is sent is included in file "os_sent_domains.xlsx" of the backup production.
[4] Cookie "ug1" is set by www.ugdturner.com, which appears to be part of Turner Broadcasting System, Inc., the owner of CNN.
[5] Details on certain cookie values transmitted to Google-associated domains are noted in Appendix F.

Source:
[1] Network transmission data.

Exhibit 1.9: Comparison of Cookie Values Transmitted to Google Domains
Browsers Tested on MacOS
https://www.latimes.com/

	Chrome				
Cookie Name	**Regular Mode (Initial Session)**	**Regular Mode (Session 1)**	**Private Browsing Mode (Session 1)**	**Private Browsing Mode (Session 2)**	**Regular Mode (Session 2)**
CMID	YlGrlUnS.YK7NARJ8H8naQAA				
DSID	NO_DATA	NO_DATA	NO_DATA		NO_DATA
IDE	AHWqTUmkQTnqDxnORDLdwaCVvSMK6U AHWqTUk5vH_WaROcriubLJkCHrHMBU AHWqTUkB5_d8Jq8-o88-KwPdTCFYL-	AHWqTUkB5_d8Jq8-o88-KwPdTCFYL-			AHWqTUkB5_d8Jq8-o88-KwPdTCFYL-
NID					511=J9ryIwZBDCbTLYF19HQjQ0VDo8
TDID		a149f5d6-a734-4680-a52f-5bdd1e			
TapAd_DID		a149f5d6-a734-4680-a52f-5bdd1e			
__gads	***ID=9765afb399b41c5d-223e9b5cfc*** ***ID=9765afb399b41c5d:T=16495195***	***ID=9765afb399b41c5d:T=16495195***	***ID=35528094fe5f08ba-226f93fcfd***	***ID=e973b71f15587c0a-22a2e45700***	***ID=9765afb399b41c5d:T=16495195***
_ga	***1346638155.1649519509***	***1346638155.1649519509***	***1683537768.1649519626***	***244998600.1649519686***	***1346638155.1649519509***
_gid	***1544315240.1649519510***	***1544315240.1649519510***	***1724929403.1649519627***	***432544252.1649519689***	***1544315240.1649519510***
b					6251ABDCF42572FC64BB9C47BLIS
google_push	AYg5qPIkCo42wiVZ_Dye6VE8SQhXu2				
ljt_reader		b82b7f6e17d609009c1e596b			
permutive-id		***fe4d5d65-babe-4192-8848-c1ebd0***	***fa0565f3-b63d-4f8b-9d61-79a32e***	***4d0a7ee6-3eae-4f6d-a452-ad9ea8***	***fe4d5d65-babe-4192-8848-c1ebd0***
sa-user-id-v2		cO6UEbjSQZxi8wU6RoCJhGQAw8Q			
suid					E1C195C16E2B493FA97FD551D65EEE
test_cookie	CheckForPermission				
uuid	***02e7b3f7-a6d9-4445-8e72-3e76fc***	***02e7b3f7-a6d9-4445-8e72-3e76fc***	***38ef5827-1d9d-4039-ae91-9faeb0***	***a37406f4-1446-477f-9e6e-3b6278***	***02e7b3f7-a6d9-4445-8e72-3e76fc***

	Safari				
Cookie Name	**Regular Mode (Initial Session)**	**Regular Mode (Session 1)**	**Private Browsing Mode (Session 1)**	**Private Browsing Mode (Session 2)**	**Regular Mode (Session 2)**
__gads	***ID=3be5ea35554fca86-227f3a38ef*** ***ID=3be5ea35554fca86:T=16491886***	***ID=3be5ea35554fca86:T=16491886***	***ID=1f7125f6c4f4a73b-22d5743aef*** ***ID=1f7125f6c4f4a73b:T=16491887***	***ID=207ffb148426bd0a-229a1120ef***	***ID=3be5ea35554fca86:T=16491886***
_ga	***457594635.1649188629***	***457594635.1649188629***	***859545785.1649188755***	***769416170.1649188825***	***457594635.1649188629***
_gid	***1188808681.1649188633***	***1188808681.1649188633***	***1458161203.1649188759***	***821401968.1649188829***	***1188808681.1649188633***
permutive-id		***85d92a15-45d0-4fa3-adf8-e9e61b***	***3dd54268-de18-4ada-b976-054c1f***		***85d92a15-45d0-4fa3-adf8-e9e61b***
uuid	***a67027a7-8a44-45fa-89ce-92625a***	***a67027a7-8a44-45fa-89ce-92625a***	***ec367644-d8e3-4a90-b86b-41c20e***	***4a8bb92a-4c5a-4e5d-a1b6-13e71d***	***a67027a7-8a44-45fa-89ce-92625a***

Notes:
[1] Only the first 30 characters of a cookie value or URL parameter sent to Google-associated domains are displayed. The full value is included in file "os_full_value.xlsx" of the backup production.
[2] ***Bold, italicized*** cookie names and values denote first-party cookies.
[3] The Google-associated domain that each cookie value is sent is included in file "os_sent_domains.xlsx" of the backup production.
[4] Details on certain cookie values transmitted to Google-associated domains are noted in Appendix F.

Source:
[1] Network transmission data.

CONFIDENTIAL – SUBJECT TO PROTECTIVE ORDER

Exhibit 1.10: Comparison of Cookie Values Transmitted to Google Domains
Browsers Tested on MacOS
https://www.washingtonpost.com/

	Chrome				
Cookie Name	**Regular Mode (Initial Session)**	**Regular Mode (Session 1)**	**Private Browsing Mode (Session 1)**	**Private Browsing Mode (Session 2)**	**Regular Mode (Session 2)**
CMID	YlGt8eoLnzTSfNA-qaSJgQAA				
DSID	NO_DATA	NO_DATA			NO_DATA
IDE	AHWqTUnesxoZVUUDIiJY3WAJXG80xZ	AHWqTUnesxoZVUUDIiJY3WAJXG80xZ			AHWqTUnesxoZVUUDIiJY3WAJXG80xZ
SCM		53825b64			
SCMg		53825b64			
__gads		***ID=61e844ac4a23a18a:T=16495201***	***ID=dc6c554802a0303f-2223051bff***	***ID=da4833ce6db11f45-22e428cd25***	***ID=61e844ac4a23a18a:T=16495201***
_ga	***459707053.1649520112***	***459707053.1649520112***	***1776625633.1649520222***	***922131970.1649520278***	***459707053.1649520112***
_ga_WRCN6 8Y2LD	***1649520111***	***1649520166***	***1649520220***	***1649520277***	***1649520322***
_gaexp	***3gY8TfBUQy645wcR55Xl0w.1***	***3gY8TfBUQy645wcR55Xl0w.1***	***3gY8TfBUQy645wcR55Xl0w.0***	***3gY8TfBUQy645wcR55Xl0w.1***	***3gY8TfBUQy645wcR55Xl0w.1***
_gid	***198550334.1649520112***	***198550334.1649520112***	***1918595905.1649520222***	***1957861325.1649520278***	***198550334.1649520112***
test_cookie	CheckForPermission				
wp_ak_v_m	***2|20220331***	***2|20220331***	***1|20220331***	***1|20220331***	***2|20220331***
wp_geo	***US|MA|506||***	***US|MA|506||***	***US|MA|506||***	***US|MA|506||***	***US|MA|506||***
wp_usp	***1---***	***1---***	***1---***	***1---***	***1---***

	Safari				
Cookie Name	**Regular Mode (Initial Session)**	**Regular Mode (Session 1)**	**Private Browsing Mode (Session 1)**	**Private Browsing Mode (Session 2)**	**Regular Mode (Session 2)**
__gads	***ID=23b1bfa17f37a4f9-22004b2f26***	***ID=23b1bfa17f37a4f9-22004b2f26***	***ID=0af56b5bbee3501a-22d41ec025***	***ID=7e5fd83e524337cc-22f35afc25***	***ID=23b1bfa17f37a4f9-22004b2f26***
_ga	***1917203225.1649478958***	***1917203225.1649478958***	***632485580.1649479068***	***1185711301.1649479118***	***1917203225.1649478958***
_ga_WRCN6 8Y2LD	***1649478957***	***1649479003***	***1649479066***	***1649479116***	***1649479181***
_gaexp	***3gY8TfBUQy645wcR55Xl0w.1***	***3gY8TfBUQy645wcR55Xl0w.1***	***3gY8TfBUQy645wcR55Xl0w.0***	***3gY8TfBUQy645wcR55Xl0w.0***	***3gY8TfBUQy645wcR55Xl0w.1***
_gid	***183146015.1649478958***	***183146015.1649478958***	***238236868.1649479068***	***2014669845.1649479118***	***183146015.1649478958***
wp_ak_subs	0|20220331		0|20220331	0|20220331	
wp_ak_v_m	***0|20220331***	***0|20220331***	***0|20220331***	***0|20220331***	***0|20220331***
wp_geo	***US|MA|506||***	***US|MA|506||***	***US|MA|506||***	***US|MA|506||***	***US|MA|506||***
wp_usp	***1---***	***1---***	***1---***	***1---***	***1---***

Notes:
[1] Only the first 30 characters of a cookie value or URL parameter sent to Google-associated domains are displayed. The full value is included in file "os_full_value.xlsx" of the backup production.
[2] ***Bold, italicized*** cookie names and values denote first-party cookies.
[3] The Google-associated domain that each cookie value is sent is included in file "os_sent_domains.xlsx" of the backup production.
[4] Details on certain cookie values transmitted to Google-associated domains are noted in Appendix F.

Source:
[1] Network transmission data.

CONFIDENTIAL – SUBJECT TO PROTECTIVE ORDER

Exhibit 1.11: Comparison of Cookie Values Transmitted to Google Domains
Browsers Tested on Android
https://www.nytimes.com/

	Chrome				
Cookie Name	**Regular Mode (Initial Session)**	**Regular Mode (Session 1)**	**Private Browsing Mode (Session 1)**	**Private Browsing Mode (Session 2)**	**Regular Mode (Session 2)**
CMID	YlCrtRsITzZLTa8a3S7N.gAA				
IDE	AHWqTUkEFDxaqbhRBq1q8edRZYO3jA	AHWqTUkEFDxaqbhRBq1q8edRZYO3jA			AHWqTUkEFDxaqbhRBq1q8edRZYO3jA
NID	511=Tr2u8L4SDRzDqGx2AGD1a_Ge51 511=ECmW6x7l0DI-qpZDKFMaNFbzjx	511=ECmW6x7l0DI-qpZDKFMaNFbzjx			511=ECmW6x7l0DI-qpZDKFMaNFbzjx
TDID		1cb4582e-69ad-445f-b42d-9e3b39			
__gads	***ID=96b055f8d88c6171:T=16494540***	***ID=96b055f8d88c6171:T=16494540***	***ID=3f24f38b7b1737e9-2227894226***		***ID=96b055f8d88c6171:T=16494540***
_ga	***2046280019.1649454006***	***2046280019.1649454006***	***2049931615.1649454125***		***2046280019.1649454006***
_gcl_au	***836349450.1649454005***	***836349450.1649454005***	***864673463.1649454125***		***836349450.1649454005***
_gid	***1560838507.1649454006***	***1560838507.1649454006***	***376221583.1649454125***		***1560838507.1649454006***
nyt-a	***SGm9_fTP7L2We59V4lQaKO***	***SGm9_fTP7L2We59V4lQaKO***	***A-8Rdj8gak2tBcw4ZHsXlH***		***SGm9_fTP7L2We59V4lQaKO***
nyt-jkidd	***anon***	***anon***	***anon***		***anon***
test_cookie	CheckForPermission	CheckForPermission			

Notes:
[1] Only the first 30 characters of a cookie value or URL parameter sent to Google-associated domains are displayed. The full value is included in file "os_full_value.xlsx" of the backup production.
[2] ***Bold, italicized*** cookie names and values denote first-party cookies.
[3] The Google-associated domain that each cookie value is sent is included in file "os_sent_domains.xlsx" of the backup production.
[4] The nyt-jkidd cookie is a first-party cookie with a long value. I observed a substring value of this long value, "anon", which matches a URL parameter sent to www.google-analytics.com. Since my exhibit shows only the substring value that was sent to Google-associated domains, I reviewed the full nyt-jkidd values across Regular and Private Browsing Mode and found that the values associated with the Private Browsing Mode were always different.
[5] Details on certain cookie values transmitted to Google-associated domains are noted in Appendix F.

Source:
[1] Network transmission data.

Exhibit 1.12: Comparison of Cookie Values Transmitted to Google Domains
Browsers Tested on Android
https://www.apartments.com/

	Chrome				
Cookie Name	**Regular Mode (Initial Session)**	**Regular Mode (Session 1)**	**Private Browsing Mode (Session 1)**	**Private Browsing Mode (Session 2)**	**Regular Mode (Session 2)**
IDE	AHWqTUn-MtscG_ayK452agrBIam27d	AHWqTUn-MtscG_ayK452agrBIam27d			AHWqTUn-MtscG_ayK452agrBIam27d
TDID	1c714a60-7d46-4a0a-b5c0-5d8bb2				
_ga	***454986845.1649456431***	***454986845.1649456431***	***971397072.1649456551***	***660890431.1649456611***	***454986845.1649456431***
_gcl_au	***566103971.1649456431***	***566103971.1649456431***	***1138193668.1649456551***	***1783034376.1649456612***	***566103971.1649456431***
_gid	***282083662.1649456431***	***282083662.1649456431***	***1562971562.1649456551***	***1907930620.1649456611***	***282083662.1649456431***
test_cookie	CheckForPermission				

Notes:
[1] Only the first 30 characters of a cookie value or URL parameter sent to Google-associated domains are displayed. The full value is included in file "os_full_value.xlsx" of the backup production.
[2] ***Bold, italicized*** cookie names and values denote first-party cookies.
[3] The Google-associated domain that each cookie value is sent is included in file "os_sent_domains.xlsx" of the backup production.
[4] Details on certain cookie values transmitted to Google-associated domains are noted in Appendix F.

Source:
[1] Network transmission data.

CONFIDENTIAL – SUBJECT TO PROTECTIVE ORDER

Exhibit 1.13: Comparison of Cookie Values Transmitted to Google Domains
Browsers Tested on Android
https://www.cnn.com/

	Chrome				
Cookie Name	**Regular Mode (Initial Session)**	**Regular Mode (Session 1)**	**Private Browsing Mode (Session 1)**	**Private Browsing Mode (Session 2)**	**Regular Mode (Session 2)**
2_C_18		2de27a3d7cba7fd27e8aafa1			
CMID		YlCpfY3UG8Qq9b9vyShnBwAA			
DSID		NO_DATA			NO_DATA
IDE	AHWqTUm9azoDAjmcnox5PA8ePEjVpT	AHWqTUm9azoDAjmcnox5PA8ePEjVpT			AHWqTUm9azoDAjmcnox5PA8ePEjVpT
V		1wHocdEMeHe1			
__gads		***ID=defa4b8c27a0ed17:T=16494534***	***ID=f610230b8a4f05d4-2272156226***		***ID=defa4b8c27a0ed17:T=16494534***
google_push					AYg5qPJxsxh5Hc74tcaH03vZHGtTw3
indxexcg		YlCpfY3UG8Qq9b9vyShnBwAAAY4AAA			
ljt_reader		2de27a3d7cba7fd27e8aafa1			2de27a3d7cba7fd27e8aafa1
ptrm		10e26250-a979-4100-bd87-836b61			
ssh	yieldmo				
test_cookie	CheckForPermission				
ug		***6250a9b40192ef0a3f85a1001602f6***	***6250a9f0022f5a0a3f8d7c0015dae5***		***6250a9b40192ef0a3f85a1001602f6***
ug1		***6250a9b40192ef0a3f85a1001602f6***	***6250a9f0022f5a0a3f8d7c0015dae5***		
uid-bp-529		10e26250-a979-4100-bd87-836b61			
uuid		***10e26250-a979-4100-bd87-836b61***			

Notes:
[1] Only the first 30 characters of a cookie value or URL parameter sent to Google-associated domains are displayed. The full value is included in file “os_full_value.xlsx” of the backup production.
[2] ***Bold, italicized*** cookie names and values denote first-party cookies.
[3] The Google-associated domain that each cookie value is sent is included in file “os_sent_domains.xlsx” of the backup production.
[4] Cookie “ug1” is set by www.ugdturner.com, which appears to be part of Turner Broadcasting System, Inc., the owner of CNN.
[5] Details on certain cookie values transmitted to Google-associated domains are noted in Appendix F.

Source:
[1] Network transmission data.

Exhibit 1.14: Comparison of Cookie Values Transmitted to Google Domains
Browsers Tested on Android
https://www.latimes.com/

	Chrome				
Cookie Name	**Regular Mode (Initial Session)**	**Regular Mode (Session 1)**	**Private Browsing Mode (Session 1)**	**Private Browsing Mode (Session 2)**	**Regular Mode (Session 2)**
CMID		YlCuvsJZ4Pyhh9OrFDI2oAAA			
DSID			NO_DATA	NO_DATA	NO_DATA
IDE	AHWqTUlZntLLEAp5qSERLlrJ0vG4PN	AHWqTUlZntLLEAp5qSERLlrJ0vG4PN			AHWqTUlZntLLEAp5qSERLlrJ0vG4PN
SCM		6b870045			
SCMg		6b870045			
TDID	46612b92-f315-47a9-8427-96d546				
__gads		***ID=60b016050e04c2c3:T=16494547***	***ID=6e37fb1a9e3c783f-2201f8ea25*** ***ID=6e37fb1a9e3c783f:T=16494548***	***ID=b15b0bac8cd13ef3:T=16494549***	***ID=60b016050e04c2c3:T=16494547***
__gpi		***UID=0000045b5f02f881:T=1649454***			
__uis		1ccb9747-4abe-4ee9-83c9-d21b76			
_ga	***1357651461.1649454723***	***1357651461.1649454723***	***1568643583.1649454842***	***1754243864.1649454902***	***1357651461.1649454723***
_gcl_au	***1446559399.1649454723***	***1446559399.1649454723***	***909784794.1649454842***	***120056235.1649454902***	***1446559399.1649454723***
_gid	***2067910102.1649454723***	***2067910102.1649454723***	***562276455.1649454842***	***1639857143.1649454903***	***2067910102.1649454723***
_rxuuid		AYg5qPIrW2RkZHWGIiPp9mN2B28Ds7			
indxexcg		YlCuvsJZ4Pyhh9OrFDI2oAAAADAAAA			
ljt_reader					ed96f5acb8dc0feea01e5643
permutive-id		***681c1821-2ffb-469e-856f-046854***	***dcbb7820-6192-44be-882a-dd219a***	***48ba868e-61e6-4a7f-b99f-e6e96f***	***681c1821-2ffb-469e-856f-046854***
ssh		triplelift			
test_cookie	CheckForPermission				
uuid		***e4930c66-ebc4-4731-acb5-61b225***	***41e467d4-8e56-4997-8fd9-59939f***	***38c2772b-6549-461b-802e-698bf5***	***e4930c66-ebc4-4731-acb5-61b225***

Notes:
[1] Only the first 30 characters of a cookie value or URL parameter sent to Google-associated domains are displayed. The full value is included in file "os_full_value.xlsx" of the backup production.
[2] ***Bold, italicized*** cookie names and values denote first-party cookies.
[3] The Google-associated domain that each cookie value is sent is included in file "os_sent_domains.xlsx" of the backup production.
[4] Details on certain cookie values transmitted to Google-associated domains are noted in Appendix F.

Source:
[1] Network transmission data.

Exhibit 1.15: Comparison of Cookie Values Transmitted to Google Domains
Browsers Tested on Android
https://www.washingtonpost.com/

	Chrome				
Cookie Name	**Regular Mode (Initial Session)**	**Regular Mode (Session 1)**	**Private Browsing Mode (Session 1)**	**Private Browsing Mode (Session 2)**	**Regular Mode (Session 2)**
1P_JAR	2022-04-08				
CMID	YlCxOKhasUkZtlblkM-7dgAA	YlCxOKhasUkZtlblkM-7dgAA			
DSID	NO_DATA	NO_DATA	NO_DATA	NO_DATA	NO_DATA
IDE	AHWqTUm94RDjDksPaWGZfqIRSMHXxe	AHWqTUm94RDjDksPaWGZfqIRSMHXxe			AHWqTUm94RDjDksPaWGZfqIRSMHXxe
SCM					d6a38ad
SCMg					d6a38ad
TDID					581b0a00-8906-48f1-8bce-7a6bf4
__gads	***ID=6b63382e564b13a5-220e0b85fc*** ***ID=6b63382e564b13a5:T=16494554***	***ID=6b63382e564b13a5:T=16494554***	***ID=bffa67ba3eaf3d0c:T=16494555***	***ID=654435610230d2f7-2204c64026***	***ID=6b63382e564b13a5:T=16494554***
_ga	***1657852058.1649455414***	***1657852058.1649455414***	***1435654157.1649455534***	***1426105914.1649455594***	***1657852058.1649455414***
_ga_WRCN6 8Y2LD	***1649455413***	***1649455473***	***1649455534***	***1649455593***	***1649455651***
_gaexp	***3gY8TfBUQy645wcR55Xl0w.1***	***3gY8TfBUQy645wcR55Xl0w.1***	***3gY8TfBUQy645wcR55Xl0w.0***	***3gY8TfBUQy645wcR55Xl0w.1***	***3gY8TfBUQy645wcR55Xl0w.1***
_gid	***601731851.1649455414***	***601731851.1649455414***	***1497313869.1649455534***	***1237172094.1649455594***	***601731851.1649455414***
test_cookie	CheckForPermission				
wp_ak_subs	0|20220331		0|20220331		
wp_ak_v_m	***0|20220331***	***0|20220331***	***0|20220331***	***1|20220331***	***0|20220331***
wp_geo	***US|MA|506||***	***US|MA|506||***	***US|MA|506||***	***US|MA|506||***	***US|MA|506||***
wp_usp	***1---***	***1---***	***1---***	***1---***	***1---***

Notes:
[1] Only the first 30 characters of a cookie value or URL parameter sent to Google-associated domains are displayed. The full value is included in file "os_full_value.xlsx" of the backup production.
[2] ***Bold, italicized*** cookie names and values denote first-party cookies.
[3] The Google-associated domain that each cookie value is sent is included in file "os_sent_domains.xlsx" of the backup production.
[4] Details on certain cookie values transmitted to Google-associated domains are noted in Appendix F.

Source:
[1] Network transmission data.

Exhibit 1.16: Comparison of Cookie Values Transmitted to Google Domains
Browsers Tested on iOS
https://www.nytimes.com/

	Chrome				
Cookie Name	**Regular Mode (Initial Session)**	**Regular Mode (Session 1)**	**Private Browsing Mode (Session 1)**	**Private Browsing Mode (Session 2)**	**Regular Mode (Session 2)**
DSID		NO_DATA		NO_DATA	NO_DATA
TDID	8545e132-0e8d-4dfb-bb94-6c6058				b0393b7f-3707-4d08-8412-6dc08a
__gads		***ID=ae484d0ff5797ff9-223de360f8***	***ID=f32763d4499cc10c-2225b660f8***	***ID=dc3af9b268aeae77-225c3624f8***	***ID=ae484d0ff5797ff9-223de360f8***
_ga	***609226067.1649286542***	***609226067.1649286542***	***1321434774.1649286665***	***94138977.1649286723***	***609226067.1649286542***
_gcl_au	***880518413.1649286542***	***880518413.1649286542***	***1621042455.1649286665***	***1300394778.1649286724***	***880518413.1649286542***
_gid	***686709648.1649286542***	***686709648.1649286542***	***212826784.1649286665***	***668196665.1649286724***	***686709648.1649286542***
nyt-a	***1v7b5uT-OEi3cV99UySWw7***	***1v7b5uT-OEi3cV99UySWw7***	***IvTzlq-Wqq-RfGLQIIa_hp***	***O3w3RGofMBQVYBnQl_d2IZ***	***1v7b5uT-OEi3cV99UySWw7***
nyt-jkidd	***anon***	***anon***	***anon***	***anon***	***anon***

	Safari				
Cookie Name	**Regular Mode (Initial Session)**	**Regular Mode (Session 1)**	**Private Browsing Mode (Session 1)**	**Private Browsing Mode (Session 2)**	**Regular Mode (Session 2)**
DSID	NO_DATA	NO_DATA	NO_DATA		
TDID			89e16966-da4a-43eb-a99d-bb2b6b	e27dd315-8bf3-4a88-97a0-2fadd3	
__gads	***ID=14b3c74663f317f5-22694201f2***	***ID=14b3c74663f317f5-22694201f2***	***ID=77ccf1d59da01fbd-22cda615f4***	***ID=48228a63e81c41eb-22bfebe8f1***	***ID=14b3c74663f317f5-22694201f2***
_ga	***1275231825.1649253871***	***1275231825.1649253871***	***607645829.1649253994***	***406951478.1649254057***	***1275231825.1649253871***
_gcl_au	***69090282.1649253871***	***69090282.1649253871***	***1779474278.1649253995***	***1007541296.1649254057***	***69090282.1649253871***
_gid	***1389587030.1649253871***	***1389587030.1649253871***	***783507812.1649253995***	***1226584434.1649254057***	***1389587030.1649253871***
nyt-a	***lCMF3dkXm1LtOX9zM4KWq-***	***lCMF3dkXm1LtOX9zM4KWq-***	***5bryYuTTaUXqwqtq-NQYQV***	***OJnbOpV0PtDISv_6nTMlAF***	***lCMF3dkXm1LtOX9zM4KWq-***
nyt-jkidd	***anon***	***anon***	***anon***	***anon***	***anon***

Notes:
[1] Only the first 30 characters of a cookie value or URL parameter sent to Google-associated domains are displayed. The full value is included in file "os_full_value.xlsx" of the backup production.
[2] ***Bold, italicized*** cookie names and values denote first-party cookies.
[3] The Google-associated domain that each cookie value is sent is included in file "os_sent_domains.xlsx" of the backup production.
[4] The nyt-jkidd cookie is a first-party cookie with a long value. I observed a substring value of this long value, "anon", which matches a URL parameter sent to www.google-analytics.com. Since my exhibit shows only the substring value that was sent to Google-associated domains, I reviewed the full nyt-jkidd values across Regular and Private Browsing Mode and found that the values associated with the Private Browsing Mode were always different.
[5] Details on certain cookie values transmitted to Google-associated domains are noted in Appendix F.

Source:
[1] Network transmission data.

Exhibit 1.17: Comparison of Cookie Values Transmitted to Google Domains
Browsers Tested on iOS
https://www.cnn.com/

	Chrome				
Cookie Name	**Regular Mode (Initial Session)**	**Regular Mode (Session 1)**	**Private Browsing Mode (Session 1)**	**Private Browsing Mode (Session 2)**	**Regular Mode (Session 2)**
DSID	NO_DATA	NO_DATA			NO_DATA
__gads	***ID=dc76151c9f730ede-22bf7b45ff***	***ID=dc76151c9f730ede-22bf7b45ff***	***ID=11d2e1045d8a6311-22b415da26***	***ID=c3b8ba15512c4b20-22f512cd25***	***ID=dc76151c9f730ede-22bf7b45ff***
dc_id	ee5f4ff5c9de42a7977ef8ddcbd300		8e58b8483c034e01a385ed2c3e6c8c	3fce806803744583899832b8b7c399	
ug	***62522c130d9aee0a3f85a1001445f2***	***62522c130d9aee0a3f85a1001445f2***	***62522c8a077bac0a3f908300169703***	***62522cc60639e00a3f85a1001547ac***	***62522c130d9aee0a3f85a1001445f2***
ug1	***62522c130d9aee0a3f85a1001445f2***		***62522c8a077bac0a3f908300169703***	***62522cc60639e00a3f85a1001547ac***	
uuid	***72a978b1c687498197c23155fc3ef2***		***2e8d63a58dcd43c28b0148d3b62de8***	***534d8334e5604db99f73c8a9055752***	

	Safari				
Cookie Name	**Regular Mode (Initial Session)**	**Regular Mode (Session 1)**	**Private Browsing Mode (Session 1)**	**Private Browsing Mode (Session 2)**	**Regular Mode (Session 2)**
__gads	***ID=3595a639744a8d80-22f37b5925***	***ID=3595a639744a8d80-22f37b5925***	***ID=247981b324f7b222-22ca219924***	***ID=ccb96a7d32cef561-2223d45c25***	***ID=3595a639744a8d80-22f37b5925***
dc_id	c0e926af2073405c9c13172128b1e7	17b84fccb9fd41f3aa8991b74038cc	9dad98e98123434b80d03989a40a48		9e452973f6c04f03bbdd37f61c00f4
ug	***624eefda0a60a40a3f8d7c0016c0ab***	***624eefda0a60a40a3f8d7c0016c0ab***	***624ef04101e17c0a3f85a1001793d3***	***624ef08007201d0a3f908300155e2a***	***624eefda0a60a40a3f8d7c0016c0ab***
ug1	***624eefda0a60a40a3f8d7c0016c0ab***		***624ef04101e17c0a3f85a1001793d3***	***624ef08007201d0a3f908300155e2a***	
uuid	***4fce07d59bb84fb8bb7fce41f136ec***	***4f0a65c2f0994769973bed3f43da45***	***ef0b53dda69544f299a2583afcb418***		***426c06abe05b48dd9096aa5fe0e53f***

Notes:
[1] Only the first 30 characters of a cookie value or URL parameter sent to Google-associated domains are displayed. The full value is included in file "os_full_value.xlsx" of the backup production.
[2] ***Bold, italicized*** cookie names and values denote first-party cookies.
[3] The Google-associated domain that each cookie value is sent is included in file "os_sent_domains.xlsx" of the backup production.
[4] Cookie "ug1" is set by www.ugdturner.com, which appears to be part of Turner Broadcasting System, Inc., the owner of CNN.
[5] Details on certain cookie values transmitted to Google-associated domains are noted in Appendix F.

Source:
[1] Network transmission data.

Exhibit 1.18: Comparison of Cookie Values Transmitted to Google Domains
Browsers Tested on iOS
https://www.apartments.com/

	Chrome				
Cookie Name	**Regular Mode (Initial Session)**	**Regular Mode (Session 1)**	**Private Browsing Mode (Session 1)**	**Private Browsing Mode (Session 2)**	**Regular Mode (Session 2)**
_ga	***1215918531.1649278474***	***1215918531.1649278474***	***904324615.1649278592***	***1470994837.1649278654***	***1215918531.1649278474***
_gcl_au	***68406730.1649278475***	***68406730.1649278475***	***1976975808.1649278592***	***483202882.1649278654***	***68406730.1649278475***
_gid	***1971561414.1649278474***	***1971561414.1649278474***	***682329440.1649278592***	***165650196.1649278654***	***1971561414.1649278474***

	Safari				
Cookie Name	**Regular Mode (Initial Session)**	**Regular Mode (Session 1)**	**Private Browsing Mode (Session 1)**	**Private Browsing Mode (Session 2)**	**Regular Mode (Session 2)**
_ga	***913533915.1649246581***	***913533915.1649246581***	***173766356.1649246699***	***1227956426.1649246760***	***913533915.1649246581***
_gcl_au	***867042350.1649246582***	***867042350.1649246582***	***1238963312.1649246699***	***2123622132.1649246761***	***867042350.1649246582***
_gid	***1381506130.1649246581***	***1381506130.1649246581***	***161524131.1649246699***	***1899095100.1649246760***	***1381506130.1649246581***

Notes:
[1] Only the first 30 characters of a cookie value or URL parameter sent to Google-associated domains are displayed. The full value is included in file "os_full_value.xlsx" of the backup production.
[2] ***Bold, italicized*** cookie names and values denote first-party cookies.
[3] The Google-associated domain that each cookie value is sent is included in file "os_sent_domains.xlsx" of the backup production.
[4] Details on certain cookie values transmitted to Google-associated domains are noted in Appendix F.

Source:
[1] Network transmission data.

CONFIDENTIAL – SUBJECT TO PROTECTIVE ORDER

Exhibit 1.19: Comparison of Cookie Values Transmitted to Google Domains
Browsers Tested on iOS
https://www.latimes.com/

	Chrome				
Cookie Name	**Regular Mode (Initial Session)**	**Regular Mode (Session 1)**	**Private Browsing Mode (Session 1)**	**Private Browsing Mode (Session 2)**	**Regular Mode (Session 2)**
__gads	***ID=981e87be546bbac2:T=16492837***	***ID=981e87be546bbac2:T=16492837***	***ID=3fe4f2c48675f7e7-227cbd77f8*** ***ID=3fe4f2c48675f7e7:T=16492839***	***ID=e33d24566c38f61d:T=16492839***	***ID=981e87be546bbac2:T=16492837***
__gpi			***UID=000003cdd6764c94:T=1649283***		
_ga	***826127504.1649283782***	***826127504.1649283782***	***974125148.1649283902***	***1110771125.1649283963***	***826127504.1649283782***
_gid	***1689258322.1649283782***	***1689258322.1649283782***	***1504429100.1649283903***	***1842974166.1649283964***	***1689258322.1649283782***
permutive-id		***a3e50f8a-c572-40a9-bc31-fa73ff***			***a3e50f8a-c572-40a9-bc31-fa73ff***
uuid	***74e01dde-cdba-4d90-be8e-10c248***	***74e01dde-cdba-4d90-be8e-10c248***	***d4546d93-bfce-4c17-8ab9-47eeed***	***a476408a-4990-4e92-a95a-8d005c***	***74e01dde-cdba-4d90-be8e-10c248***

	Safari				
Cookie Name	**Regular Mode (Initial Session)**	**Regular Mode (Session 1)**	**Private Browsing Mode (Session 1)**	**Private Browsing Mode (Session 2)**	**Regular Mode (Session 2)**
__gads	***ID=9c9ebbf8ad5f59f5-2215c89ff3*** ***ID=9c9ebbf8ad5f59f5:T=16492473***	***ID=9c9ebbf8ad5f59f5:T=16492473***	***ID=f9f0b0c394ce59d6-22e8969ef3*** ***ID=f9f0b0c394ce59d6:T=16492474***	***ID=457e5cd3303f940c-2228d610f2*** ***ID=457e5cd3303f940c:T=16492475***	***ID=9c9ebbf8ad5f59f5:T=16492473***
__gpi		***UID=000003c76dfb24d1:T=1649247***			
_ga	***1310634745.1649247332***	***1310634745.1649247332***	***826099050.1649247456***	***847134733.1649247512***	***1310634745.1649247332***
_gid	***1721851811.1649247332***	***1721851811.1649247332***	***2086054811.1649247456***	***1794537520.1649247513***	***1721851811.1649247332***
permutive-id		***99de973b-577f-45bb-811a-6b3b8b***		***86fd053b-dffa-41aa-ab18-b8be1a***	***99de973b-577f-45bb-811a-6b3b8b***
uuid	***7856be3d-32a9-4313-a9ff-b314e7***	***7856be3d-32a9-4313-a9ff-b314e7***	***4d3387f6-9f3b-471a-b11c-92672b***	***8a421678-5c1f-4acf-ace3-3df2d5***	***7856be3d-32a9-4313-a9ff-b314e7***

Notes:
[1] Only the first 30 characters of a cookie value or URL parameter sent to Google-associated domains are displayed. The full value is included in file "os_full_value.xlsx" of the backup production.
[2] ***Bold, italicized*** cookie names and values denote first-party cookies.
[3] The Google-associated domain that each cookie value is sent is included in file "os_sent_domains.xlsx" of the backup production.
[4] Details on certain cookie values transmitted to Google-associated domains are noted in Appendix F.

Source:
[1] Network transmission data.

CONFIDENTIAL – SUBJECT TO PROTECTIVE ORDER

Exhibit 1.20: Comparison of Cookie Values Transmitted to Google Domains
Browsers Tested on iOS
https://www.washingtonpost.com/

	Chrome				
Cookie Name	**Regular Mode (Initial Session)**	**Regular Mode (Session 1)**	**Private Browsing Mode (Session 1)**	**Private Browsing Mode (Session 2)**	**Regular Mode (Session 2)**
__gads	***ID=46a38265bd177d35-2258097bf8***	***ID=46a38265bd177d35-2258097bf8***			***ID=46a38265bd177d35-2258097bf8***
_ga	***1529774417.1649285421***	***1529774417.1649285421***	***84592648.1649285529***	***2143282438.1649285586***	***1529774417.1649285421***
8Y2LD	***1649285420***	***1649285468***	***1649285528***	***1649285585***	***1649285643***
_gaexp	***3gY8TfBUQy645wcR55Xl0w.1***	***3gY8TfBUQy645wcR55Xl0w.1***	***3gY8TfBUQy645wcR55Xl0w.0***	***3gY8TfBUQy645wcR55Xl0w.0***	***3gY8TfBUQy645wcR55Xl0w.1***
_gid	***1042611665.1649285421***	***1042611665.1649285421***	***57941596.1649285529***	***1778662269.1649285586***	***1042611665.1649285421***
wp_ak_subs	0|20220331				
wp_ak_v_m	***0|20220331***	***0|20220331***	***2|20220331***	***1|20220331***	***0|20220331***
wp_geo	***US|MA|506||***	***US|MA|506||***	***US|MA|506||***	***US|MA|506||***	***US|MA|506||***
wp_usp	***1---***	***1---***	***1---***	***1---***	***1---***

	Safari				
Cookie Name	**Regular Mode (Initial Session)**	**Regular Mode (Session 1)**	**Private Browsing Mode (Session 1)**	**Private Browsing Mode (Session 2)**	**Regular Mode (Session 2)**
__gads	***ID=64e4ce0a583468d6-22b76cf8f1***	***ID=64e4ce0a583468d6-22b76cf8f1***	***ID=62d3d68d475f31ad-2232ec22f4***	***ID=1990c1b27e4d681a-229d7afef1***	***ID=64e4ce0a583468d6-22b76cf8f1***
_ga	***1459139403.1649248533***	***1459139403.1649248533***	***465309642.1649248653***	***1955154597.1649248714***	***1459139403.1649248533***
_ga_WRCN6					
8Y2LD	***1649248531***	***1649248593***	***1649248651***	***1649248712***	***1649248770***
_gaexp	***3gY8TfBUQy645wcR55Xl0w.1***	***3gY8TfBUQy645wcR55Xl0w.1***	***3gY8TfBUQy645wcR55Xl0w.0***	***3gY8TfBUQy645wcR55Xl0w.1***	***3gY8TfBUQy645wcR55Xl0w.1***
_gid	***818063765.1649248533***	***818063765.1649248533***	***923378556.1649248653***	***163207506.1649248714***	***818063765.1649248533***
wp_ak_subs	0|20220331				
wp_ak_v_m	***0|20220331***	***0|20220331***	***2|20220331***	***1|20220331***	***0|20220331***
wp_geo	***US|MA|506||***	***US|MA|506||***	***US|MA|506||***	***US|MA|506||***	***US|MA|506||***
wp_usp	***1---***	***1---***	***1---***	***1---***	***1---***

Notes:
[1] Only the first 30 characters of a cookie value or URL parameter sent to Google-associated domains are displayed. The full value is included in file "os_full_value.xlsx" of the backup production.
[2] ***Bold, italicized*** cookie names and values denote first-party cookies.
[3] The Google-associated domain that each cookie value is sent is included in file "os_sent_domains.xlsx" of the backup production.
[4] Details on certain cookie values transmitted to Google-associated domains are noted in Appendix F.

Source:
[1] Network transmission data.

CONFIDENTIAL – SUBJECT TO PROTECTIVE ORDER

Exhibit 2.1: Comparison of Cookie Values Transmitted to Google Domains
Cookie Blocking Test
Chrome Browser Tested on Windows 10 in Regular Browsing Mode
https://www.nytimes.com/

Cookie Name	All Cookies Allowed	Third-Party Cookies Blocked	All Cookies Blocked
CMID	Ykt3xkNL4d2RB-ccS4d.EAAA		
DSID	NO_DATA		
IDE	AHWqTUna_YBa1VlgiS4PvIMhqPWCmG		
NID	511=dXb2DsuyaVRWxI1OEWu_3ShxKD		
TDID	55f3c6bb-be1a-47c6-a02f-708492		
__gads	***ID=7daab1ea7e0c2bfd-229c5916ef*** ***ID=7daab1ea7e0c2bfd:T=16491130***	***ID=c812a6115292ec74-22e4581eef***	
_ga	***2086276930.1649113029***	***1874936498.1649113314***	
_gcl_au	***1104313509.1649113031***	***1661519211.1649113316***	
_gid	***159707026.1649113031***	***2082113795.1649113317***	
nyt-a	***oy1qGEePBBoEyfGfuiXEgB***	***RABLaoBVSl-w7akUWOiGnx***	
nyt-jkidd	***anon***	***anon***	
test_cookie	CheckForPermission		
tuuid	cd9d156c-e16c-48b2-ae69-c2ccfd		

Notes:
[1] Only the first 30 characters of a cookie value or URL parameter sent to Google-associated domains are displayed. The full value is included in file "settings_full_value.xlsx" of the backup production.
[2] ***Bold, italicized*** cookie names and values denote first-party cookies.
[3] The Google-associated domain that each cookie value is sent is included in file "settings_sent_domains.xlsx" of the backup production.
[4] Details on certain cookie values transmitted to Google-associated domains are noted in Appendix F.

Source:
[1] Network transmission data.

Exhibit 2.2: Comparison of Cookie Values Transmitted to Google Domains
Cookie Blocking Test
Chrome Browser Tested on Windows 10 in Regular Browsing Mode
https://www.cnn.com/

Cookie Name	All Cookies Allowed	Third-Party Cookies Blocked	All Cookies Blocked
CMID	YktiyrJeL4230ZaiKS1D5wAA		
IDE	AHWqTUmo3IWU5r_-wP3WVzVYJVuPiT		
V	EGP4VCLm7HML		
__gads	***ID=b1feac9e314e9ca5-222ac105ef*** ***ID=b1feac9e314e9ca5:T=16491076***	***ID=a6ce9bde480e43d9-22d2ef0eef***	
__gpi		***UID=000003b2c2d7402a:T=1649108***	
bdswch	256892f1-2deb-4ba1-ad03-f83b5f		
buid	256892f1-2deb-4ba1-ad03-f83b5f		
indxexcg	YktiyrJeL4230ZaiKS1D5wAAA7QAAA		
ptrbsw	256892f1-2deb-4ba1-ad03-f83b5f		
ptrpp	EGP4VCLm7HML		
test_cookie	CheckForPermission		
tuuid	256892f1-2deb-4ba1-ad03-f83b5f		
ug	***624b62c8005b1c0a3f908300165dcd***	***624b64e80c4ccc0a3f908300154520***	
ug1	***624b62c8005b1c0a3f908300165dcd***	***624b64e80c4ccc0a3f908300154520***	

Notes:
[1] Only the first 30 characters of a cookie value or URL parameter sent to Google-associated domains are displayed. The full value is included in file "settings_full_value.xlsx" of the backup production.
[2] ***Bold, italicized*** cookie names and values denote first-party cookies.
[3] The Google-associated domain that each cookie value is sent is included in file "settings_sent_domains.xlsx" of the backup production.
[4] Cookie "ug1" is set by www.ugdturner.com, which appears to be part of Turner Broadcasting System, Inc., the owner of CNN.
[5] Details on certain cookie values transmitted to Google-associated domains are noted in Appendix F.

Source:
[1] Network transmission data.

CONFIDENTIAL – SUBJECT TO PROTECTIVE ORDER

Exhibit 2.3: Comparison of Cookie Values Transmitted to Google Domains
Cookie Blocking Test
Chrome Browser Tested on Windows 10 in Regular Browsing Mode
https://www.apartments.com/

Cookie Name	All Cookies Allowed	Third-Party Cookies Blocked	All Cookies Blocked
IDE	AHWqTUnPoC9ZcjLX3rBJP1dmBdlYnu		
_ga	***2136294989.1649106224***	***1104986070.1649106543***	
_gcl_au	***2140085877.1649106224***	***796005447.1649106543***	
_gid	***71093476.1649106224***	***380695983.1649106543***	
test_cookie	CheckForPermission		

Notes:
[1] Only the first 30 characters of a cookie value or URL parameter sent to Google-associated domains are displayed. The full value is included in file “settings_full_value.xlsx” of the backup production.
[2] ***Bold, italicized*** cookie names and values denote first-party cookies.
[3] The Google-associated domain that each cookie value is sent is included in file “settings_sent_domains.xlsx” of the backup production.
[4] Details on certain cookie values transmitted to Google-associated domains are noted in Appendix F.

Source:
[1] Network transmission data.

Exhibit 2.4: Comparison of Cookie Values Transmitted to Google Domains
Cookie Blocking Test
Chrome Browser Tested on Windows 10 in Regular Browsing Mode
https://www.latimes.com/

Cookie Name	All Cookies Allowed	Third-Party Cookies Blocked	All Cookies Blocked
CMID	YktrAIIf3Zd5iNP2SiHpqAAA		
DSID	NO_DATA	NO_DATA	
IDE	AHWqTUmfYMJH7_jyOL__9TCchFnGXO		
TDID	025216e0-ff41-4fd3-a113-c87854		
__gads	***ID=a60a78df2b4d7cfa-224aa90cef*** ***ID=a60a78df2b4d7cfa:T=16491097***	***ID=8219a7932f875459-22cd4c35ef*** ***ID=8219a7932f875459:T=16491101***	
__uis	b8071472-7593-4c4a-a903-279140		
_ga	***2132850896.1649109759***	***182528510.1649110193***	
_gid	***2118316826.1649109760***	***1173053119.1649110193***	
permutive-id		***19744878-8f64-4514-84c4-cbc522***	
ssh	triplelift		
test_cookie	CheckForPermission		
ttd	025216e0-ff41-4fd3-a113-c87854		
uid-bp-892	025216e0-ff41-4fd3-a113-c87854		
uuid	***a872e0ba-bcde-44ef-b6ae-a5ba54***	***529f8d48-3dff-408a-a971-24104d***	

Notes:
[1] Only the first 30 characters of a cookie value or URL parameter sent to Google-associated domains are displayed. The full value is included in file "settings_full_value.xlsx" of the backup production.
[2] ***Bold, italicized*** cookie names and values denote first-party cookies.
[3] The Google-associated domain that each cookie value is sent is included in file "settings_sent_domains.xlsx" of the backup production.
[4] Details on certain cookie values transmitted to Google-associated domains are noted in Appendix F.

Source:
[1] Network transmission data.

CONFIDENTIAL – SUBJECT TO PROTECTIVE ORDER

Exhibit 2.5: Comparison of Cookie Values Transmitted to Google Domains
Cookie Blocking Test
Chrome Browser Tested on Windows 10 in Regular Browsing Mode
https://www.washingtonpost.com/

Cookie Name	All Cookies Allowed	Third-Party Cookies Blocked	All Cookies Blocked
CMID	Ykt.RiKyIVI68lkLc3ItFgAA		
DSID	NO_DATA		
IDE	AHWqTUmVj-VjMQZ8aD41TxtACOsH_O		
__gads	***ID=f8245f857df1b360-22937904ef*** ***ID=f8245f857df1b360:T=16491146***	***ID=7b12db9ffc3853a2-22f8362def***	
_ga	***632871189.1649114693***	***403485201.1649114924***	
_ga_WRCN68Y2LD	***1649114692***	***1649114923***	
_gaexp	***3gY8TfBUQy645wcR55Xl0w.0***	***3gY8TfBUQy645wcR55Xl0w.1***	
_gid	***372893291.1649114693***	***814725271.1649114924***	
test_cookie	CheckForPermission		
wp_ak_subs	0|20220331		
wp_ak_v_m	***0|20220331***	***1|20220331***	
wp_geo	***US|VA|511||***	***US|VA|511||***	
wp_usp	***1---***	***1---***	

Notes:
[1] Only the first 30 characters of a cookie value or URL parameter sent to Google-associated domains are displayed. The full value is included in file "settings_full_value.xlsx" of the backup production.
[2] ***Bold, italicized*** cookie names and values denote first-party cookies.
[3] The Google-associated domain that each cookie value is sent is included in file "settings_sent_domains.xlsx" of the backup production.
[4] Details on certain cookie values transmitted to Google-associated domains are noted in Appendix F.

Source:
[1] Network transmission data.

CONFIDENTIAL – SUBJECT TO PROTECTIVE ORDER

Exhibit 2.6: Comparison of Cookie Values Transmitted to Google Domains
JavaScript Blocking Test
Chrome Browser Tested on Windows 10 in Regular Browsing Mode
https://www.nytimes.com/

Cookie Name	JavaScript Enabled	Sybu Enabled	JavaScript Disabled
CMID	Ykt3xkNL4d2RB-ccS4d.EAAA		
DSID	NO_DATA		
IDE	AHWqTUna_YBa1VlgiS4PvIMhqPWCmG		
NID	511=dXb2DsuyaVRWxI1OEWu_3ShxKD		
TDID	55f3c6bb-be1a-47c6-a02f-708492		
__gads	***ID=7daab1ea7e0c2bfd-229c5916ef*** ***ID=7daab1ea7e0c2bfd:T=16491130***		
_ga	***2086276930.1649113029***		
_gcl_au	***1104313509.1649113031***		
_gid	***159707026.1649113031***		
nyt-a	***oy1qGEePBBoEyfGfuiXEgB***		
nyt-jkidd	***anon***		
test_cookie	CheckForPermission	CheckForPermission	
tuuid	cd9d156c-e16c-48b2-ae69-c2ccfd	3f54261b-68a1-4b16-bd48-1ffaaf	

Notes:
[1] Only the first 30 characters of a cookie value or URL parameter sent to Google-associated domains are displayed. The full value is included in file “settings_full_value.xlsx” of the backup production.
[2] ***Bold, italicized*** cookie names and values denote first-party cookies.
[3] The Google-associated domain that each cookie value is sent is included in file “settings_sent_domains.xlsx” of the backup production.
[4] Details on certain cookie values transmitted to Google-associated domains are noted in Appendix F.

Source:
[1] Network transmission data.

Exhibit 2.7: Comparison of Cookie Values Transmitted to Google Domains
JavaScript Blocking Test
Chrome Browser Tested on Windows 10 in Regular Browsing Mode
https://www.cnn.com/

Cookie Name	JavaScript Enabled	Sybu Enabled	JavaScript Disabled
CMID	YktiyrJeL4230ZaiKS1D5wAA	YldiK-TzeYjLgaKtRQFwkQAA	
IDE	AHWqTUmo3IWU5r_-wP3WVzVYJVuPiT	AHWqTUlXtZQxbB40YS5Cadv7ggV0hd	
V	EGP4VCLm7HML		
__gads	***ID=b1feac9e314e9ca5-222ac105ef*** ***ID=b1feac9e314e9ca5:T=16491076***		
bdswch	256892f1-2deb-4ba1-ad03-f83b5f		
buid	256892f1-2deb-4ba1-ad03-f83b5f		
indxexcg	YktiyrJeL4230ZaiKS1D5wAAA7QAAA		
ptrbsw	256892f1-2deb-4ba1-ad03-f83b5f		
ptrpp	EGP4VCLm7HML		
test_cookie	CheckForPermission	CheckForPermission	
tuuid	256892f1-2deb-4ba1-ad03-f83b5f		
ug	***624b62c8005b1c0a3f908300165dcd***		
ug1	***624b62c8005b1c0a3f908300165dcd***		

Notes:
[1] Only the first 30 characters of a cookie value or URL parameter sent to Google-associated domains are displayed. The full value is included in file "settings_full_value.xlsx" of the backup production.
[2] ***Bold, italicized*** cookie names and values denote first-party cookies.
[3] The Google-associated domain that each cookie value is sent is included in file "settings_sent_domains.xlsx" of the backup production.
[4] Cookie "ug1" is set by www.ugdturner.com, which appears to be part of Turner Broadcasting System, Inc., the owner of CNN.
[5] Details on certain cookie values transmitted to Google-associated domains are noted in Appendix F.

Source:
[1] Network transmission data.

Exhibit 2.8: Comparison of Cookie Values Transmitted to Google Domains
JavaScript Blocking Test
Chrome Browser Tested on Windows 10 in Regular Browsing Mode
https://www.apartments.com/

Cookie Name	JavaScript Enabled	Sybu Enabled	JavaScript Disabled
IDE	AHWqTUnPoC9ZcjLX3rBJP1dmBdlYnu		
_ga	***2136294989.1649106224***		
_gcl_au	***2140085877.1649106224***		
_gid	***71093476.1649106224***		
test_cookie	CheckForPermission		

Notes:
[1] Only the first 30 characters of a cookie value or URL parameter sent to Google-associated domains are displayed. The full value is included in file "settings_full_value.xlsx" of the backup production.
[2] ***Bold, italicized*** cookie names and values denote first-party cookies.
[3] The Google-associated domain that each cookie value is sent is included in file "settings_sent_domains.xlsx" of the backup production.
[4] Details on certain cookie values transmitted to Google-associated domains are noted in Appendix F.

Source:
[1] Network transmission data.

Exhibit 2.9: Comparison of Cookie Values Transmitted to Google Domains
JavaScript Blocking Test
Chrome Browser Tested on Windows 10 in Regular Browsing Mode
https://www.latimes.com/

Cookie Name	JavaScript Enabled	Sybu Enabled	JavaScript Disabled
CMID	YktrAIIf3Zd5iNP2SiHpqAAA		
DSID	NO_DATA		
IDE	AHWqTUmfYMJH7_jyOL__9TCchFnGXO		
TDID	025216e0-ff41-4fd3-a113-c87854		
__gads	***ID=a60a78df2b4d7cfa-224aa90cef*** ***ID=a60a78df2b4d7cfa:T=16491097***		
__uis	b8071472-7593-4c4a-a903-279140		
_ga	***2132850896.1649109759***		
_gid	***2118316826.1649109760***		
ssh	triplelift		
test_cookie	CheckForPermission		
ttd	025216e0-ff41-4fd3-a113-c87854		
uid-bp-892	025216e0-ff41-4fd3-a113-c87854		
uuid	***a872e0ba-bcde-44ef-b6ae-a5ba54***		

Notes:
[1] Only the first 30 characters of a cookie value or URL parameter sent to Google-associated domains are displayed. The full value is included in file "settings_full_value.xlsx" of the backup production.
[2] ***Bold, italicized*** cookie names and values denote first-party cookies.
[3] The Google-associated domain that each cookie value is sent is included in file "settings_sent_domains.xlsx" of the backup production.
[4] Details on certain cookie values transmitted to Google-associated domains are noted in Appendix F.

Source:
[1] Network transmission data.

Exhibit 2.10: Comparison of Cookie Values Transmitted to Google Domains
JavaScript Blocking Test
Chrome Browser Tested on Windows 10 in Regular Browsing Mode
https://www.washingtonpost.com/

Cookie Name	JavaScript Enabled	Sybu Enabled	JavaScript Disabled
CMID	Ykt.RiKyIVI68lkLc3ItFgAA		
DSID	NO_DATA		
IDE	AHWqTUmVj-VjMQZ8aD41TxtACOsH_O		
__gads	***ID=f8245f857df1b360-22937904ef*** ***ID=f8245f857df1b360:T=16491146***		
_ga	***632871189.1649114693***		
_ga_WRCN68Y2LD	***1649114692***		
_gaexp	***3gY8TfBUQy645wcR55Xl0w.0***		
_gid	***372893291.1649114693***		
test_cookie	CheckForPermission		
wp_ak_subs	0|20220331		
wp_ak_v_m	***0|20220331***		
wp_geo	***US|VA|511||***		
wp_usp	***1---***		

Notes:
[1] Only the first 30 characters of a cookie value or URL parameter sent to Google-associated domains are displayed. The full value is included in file "settings_full_value.xlsx" of the backup production.
[2] ***Bold, italicized*** cookie names and values denote first-party cookies.
[3] The Google-associated domain that each cookie value is sent is included in file "settings_sent_domains.xlsx" of the backup production.
[4] Details on certain cookie values transmitted to Google-associated domains are noted in Appendix F.

Source:
[1] Network transmission data.

Exhibit 2.11: Comparison of Cookie Values Transmitted to Google Domains
Google Analytics Opt-Out Extension Test
Chrome Browser Tested on Windows 10 in Regular Browsing Mode
https://www.nytimes.com/

Cookie Name	Google Analytics Opt-Out Disabled	Google Analytics Opt-Out Enabled
CMID	Ykt3xkNL4d2RB-ccS4d.EAAA	Ykt71xG8Sbyit5c4hafbEgAA
DSID	NO_DATA	NO_DATA
IDE	AHWqTUna_YBa1VlgiS4PvIMhqPWCmG	AHWqTUmUSHJkfpdgBl6QY8PEJXBVws
NID	511=dXb2DsuyaVRWxI1OEWu_3ShxKD	511=IjA2XAoGdJx_FjMCFHQ4H_FNfm
TDID	55f3c6bb-be1a-47c6-a02f-708492	
__gads	***ID=7daab1ea7e0c2bfd-229c5916ef ID=7daab1ea7e0c2bfd:T=16491130***	***ID=5d83d68676d09653-222ec42bef ID=5d83d68676d09653:T=16491140***
_ga	***2086276930.1649113029***	
_gcl_au	***1104313509.1649113031***	***1916057142.1649114074***
_gid	***159707026.1649113031***	
nyt-a	***oy1qGEePBBoEyfGfuiXEgB***	***RXnfezEaR8UvdGRKa-xnVS***
nyt-jkidd	***anon***	
test_cookie	CheckForPermission	CheckForPermission
tuuid	cd9d156c-e16c-48b2-ae69-c2ccfd	

Notes:
[1] Only the first 30 characters of a cookie value or URL parameter sent to Google-associated domains are displayed. The full value is included in file "settings_full_value.xlsx" of the backup production.
[2] ***Bold, italicized*** cookie names and values denote first-party cookies.
[3] The Google-associated domain that each cookie value is sent is included in file "settings_sent_domains.xlsx" of the backup production.
[4] Details on certain cookie values transmitted to Google-associated domains are noted in Appendix F.

Source:
[1] Network transmission data.

CONFIDENTIAL – SUBJECT TO PROTECTIVE ORDER

Exhibit 2.12: Comparison of Cookie Values Transmitted to Google Domains
Google Analytics Opt-Out Extension Test
Chrome Browser Tested on Windows 10 in Regular Browsing Mode
https://www.cnn.com/

Cookie Name	Google Analytics Opt-Out Disabled	Google Analytics Opt-Out Enabled
CMID	YktiyrJeL4230ZaiKS1D5wAA	YktneWgCqMmmICitT-W0kgAA
IDE	AHWqTUmo3IWU5r_-wP3WVzVYJVuPiT	AHWqTUmwBsyhCEOmnm-IaqGsKjsGow
V	EGP4VCLm7HML	
__gads	***ID=b1feac9e314e9ca5-222ac105ef*** ***ID=b1feac9e314e9ca5:T=16491076***	***ID=664c721f0a03cd49-22bf211def*** ***ID=664c721f0a03cd49:T=16491088***
bdswch	256892f1-2deb-4ba1-ad03-f83b5f	
buid	256892f1-2deb-4ba1-ad03-f83b5f	
indxexcg	YktiyrJeL4230ZaiKS1D5wAAA7QAAA	YktneWgCqMmmICitT_W0kgAAA74AAA
ptrbsw	256892f1-2deb-4ba1-ad03-f83b5f	
ptrpp	EGP4VCLm7HML	
test_cookie	CheckForPermission	CheckForPermission
tuuid	256892f1-2deb-4ba1-ad03-f83b5f	
ug	***624b62c8005b1c0a3f908300165dcd***	***624b6776052e150a3f85a10016d5a0***
ug1	***624b62c8005b1c0a3f908300165dcd***	***624b6776052e150a3f85a10016d5a0***

Notes:
[1] Only the first 30 characters of a cookie value or URL parameter sent to Google-associated domains are displayed. The full value is included in file "settings_full_value.xlsx" of the backup production.
[2] ***Bold, italicized*** cookie names and values denote first-party cookies.
[3] The Google-associated domain that each cookie value is sent is included in file "settings_sent_domains.xlsx" of the backup production.
[4] Cookie "ug1" is set by www.ugdturner.com, which appears to be part of Turner Broadcasting System, Inc., the owner of CNN.
[5] Details on certain cookie values transmitted to Google-associated domains are noted in Appendix F.

Source:
[1] Network transmission data.

Exhibit 2.13: Comparison of Cookie Values Transmitted to Google Domains
Google Analytics Opt-Out Extension Test
Chrome Browser Tested on Windows 10 in Regular Browsing Mode
https://www.apartments.com/

Cookie Name	Google Analytics Opt-Out Disabled	Google Analytics Opt-Out Enabled
IDE	AHWqTUnPoC9ZcjLX3rBJP1dmBdlYnu	AHWqTUlG62-jYn2lHxd7i1J5XG-TPH
TDID		e4c0e944-bf51-4c67-9a49-3e3b7e
_ga	***2136294989.1649106224***	
_gcl_au	***2140085877.1649106224***	***1767913044.1649107071***
_gid	***71093476.1649106224***	
test_cookie	CheckForPermission	CheckForPermission

Notes:
[1] Only the first 30 characters of a cookie value or URL parameter sent to Google-associated domains are displayed. The full value is included in file “settings_full_value.xlsx” of the backup production.
[2] ***Bold, italicized*** cookie names and values denote first-party cookies.
[3] The Google-associated domain that each cookie value is sent is included in file “settings_sent_domains.xlsx” of the backup production.
[4] Details on certain cookie values transmitted to Google-associated domains are noted in Appendix F.

Source:
[1] Network transmission data.

Exhibit 2.14: Comparison of Cookie Values Transmitted to Google Domains
Google Analytics Opt-Out Extension Test
Chrome Browser Tested on Windows 10 in Regular Browsing Mode
https://www.latimes.com/

Cookie Name	Google Analytics Opt-Out Disabled	Google Analytics Opt-Out Enabled
CMID	YktrAIIf3Zd5iNP2SiHpqAAA	YktvGN2clHmCx28oTPE14gAA
DSID	NO_DATA	
IDE	AHWqTUmfYMJH7_jyOL__9TCchFnGXO	AHWqTUl_ZbR6k8L1JzchJYMDpinniJ
TDID	025216e0-ff41-4fd3-a113-c87854	4427e8d9-1752-4a3b-b97f-8a5074
	ID=a60a78df2b4d7cfa-224aa90cef	
__gads	***ID=a60a78df2b4d7cfa:T=16491097***	***ID=c89cf5d553be072e:T=16491108***
__uis	b8071472-7593-4c4a-a903-279140	
_ga	***2132850896.1649109759***	
_gid	***2118316826.1649109760***	
_rxuuid		AYg5qPJPWB2BYGkvJxuQfbDT7novZQ
google_push		AYg5qPLsUoaI7TaWYE5vjYzQ_VFSQV
permutive-id		***2aaeb062-2e32-4406-b30e-065dae***
sa-user-id-v2		wCMjxm_iTW1Hva6HXgaz7RTnUu4
ssh	triplelift	triplelift
test_cookie	CheckForPermission	CheckForPermission
ttd	025216e0-ff41-4fd3-a113-c87854	
tv_UIDF		CAESEFznsLkm0y_OQIaOf2uiFEU
uid-bp-892	025216e0-ff41-4fd3-a113-c87854	
uuid	***a872e0ba-bcde-44ef-b6ae-a5ba54***	***7f2ea8be-c8a3-4e08-95b0-34d954***

Notes:
[1] Only the first 30 characters of a cookie value or URL parameter sent to Google-associated domains are displayed. The full value is included in file "settings_full_value.xlsx" of the backup production.
[2] ***Bold, italicized*** cookie names and values denote first-party cookies.
[3] The Google-associated domain that each cookie value is sent is included in file "settings_sent_domains.xlsx" of the backup production.
[4] Details on certain cookie values transmitted to Google-associated domains are noted in Appendix F.

Source:
[1] Network transmission data.

Exhibit 2.15: Comparison of Cookie Values Transmitted to Google Domains
Google Analytics Opt-Out Extension Test
Chrome Browser Tested on Windows 10 in Regular Browsing Mode
https://www.washingtonpost.com/

Cookie Name	Google Analytics Opt-Out Disabled	Google Analytics Opt-Out Enabled
CMID	Ykt.RiKyIVI68lkLc3ItFgAA	YkuBqOQnm2lH-bn4fLb01QAA
DSID	NO_DATA	NO_DATA
IDE	AHWqTUmVj-VjMQZ8aD41TxtACOsH_O	AHWqTUmZ7Refb7gTkcM5hzTayBORmW
__gads	***ID=f8245f857df1b360-22937904ef*** ***ID=f8245f857df1b360:T=16491146***	***ID=29d1dc3fab2891b3-22305c0fef*** ***ID=29d1dc3fab2891b3:T=16491155***
_ga	***632871189.1649114693***	
_ga_WRCN68Y2LD	***1649114692***	
_gaexp	***3gY8TfBUQy645wcR55Xl0w.0***	
_gid	***372893291.1649114693***	
test_cookie	CheckForPermission	CheckForPermission
wp_ak_subs	0|20220331	
wp_ak_v_m	***0|20220331***	
wp_geo	***US|VA|511||***	
wp_usp	***1---***	***1---***

Notes:
[1] Only the first 30 characters of a cookie value or URL parameter sent to Google-associated domains are displayed. The full value is included in file "settings_full_value.xlsx" of the backup production.
[2] ***Bold, italicized*** cookie names and values denote first-party cookies.
[3] The Google-associated domain that each cookie value is sent is included in file "settings_sent_domains.xlsx" of the backup production.
[4] Details on certain cookie values transmitted to Google-associated domains are noted in Appendix F.

Source:
[1] Network transmission data.

CONFIDENTIAL – SUBJECT TO PROTECTIVE ORDER

Exhibit 2.16: Comparison of Cookie Values Transmitted to Google Domains
uBlock Extension Test
Chrome Browser Tested on Windows 10 in Regular Browsing Mode
https://www.nytimes.com/

Cookie Name	uBlock Disabled	uBlock Enabled
CMID	Ykt3xkNL4d2RB-ccS4d.EAAA	
DSID	NO_DATA	
IDE	AHWqTUna_YBa1VlgiS4PvIMhqPWCmG	
NID	511=dXb2DsuyaVRWxI1OEWu_3ShxKD	511=mhOfLbkN9lyhJUFLWam-U9s8Ps
TDID	55f3c6bb-be1a-47c6-a02f-708492	
__gads	***ID=7daab1ea7e0c2bfd-229c5916efID=7daab1ea7e0c2bfd:***	
_ga	***2086276930.1649113029***	
_gcl_au	***1104313509.1649113031***	
_gid	***159707026.1649113031***	
nyt-a	***oy1qGEePBBoEyfGfuiXEgB***	
nyt-jkidd	***anon***	
test_cookie	CheckForPermission	
tuuid	cd9d156c-e16c-48b2-ae69-c2ccfd	

Notes:
[1] Only the first 30 characters of a cookie value or URL parameter sent to Google-associated domains are displayed. The full value is included in file "settings_full_value.xlsx" of the backup production.
[2] ***Bold, italicized*** cookie names and values denote first-party cookies.
[3] The Google-associated domain that each cookie value is sent is included in file "settings_sent_domains.xlsx" of the backup production.
[4] Details on certain cookie values transmitted to Google-associated domains are noted in Appendix F.

Source:
[1] Network transmission data.

Exhibit 2.17: Comparison of Cookie Values Transmitted to Google Domains
uBlock Extension Test
Chrome Browser Tested on Windows 10 in Regular Browsing Mode
https://www.cnn.com/

Cookie Name	uBlock Disabled	uBlock Enabled
CMID	YktiyrJeL4230ZaiKS1D5wAA	
IDE	AHWqTUmo3IWU5r_-wP3WVzVYJVuPiT	
V	EGP4VCLm7HML	
__gads	***ID=b1feac9e314e9ca5-222ac105ef*** ***ID=b1feac9e314e9ca5:T=16491076***	
bdswch	256892f1-2deb-4ba1-ad03-f83b5f	
buid	256892f1-2deb-4ba1-ad03-f83b5f	
indxexcg	YktiyrJeL4230ZaiKS1D5wAAA7QAAA	
ptrbsw	256892f1-2deb-4ba1-ad03-f83b5f	
ptrpp	EGP4VCLm7HML	
test_cookie	CheckForPermission	
tuuid	256892f1-2deb-4ba1-ad03-f83b5f	
ug	***624b62c8005b1c0a3f908300165dcd***	
ug1	***624b62c8005b1c0a3f908300165dcd***	

Notes:
[1] Only the first 30 characters of a cookie value or URL parameter sent to Google-associated domains are displayed. The full value is included in file "settings_full_value.xlsx" of the backup production.
[2] ***Bold, italicized*** cookie names and values denote first-party cookies.
[3] The Google-associated domain that each cookie value is sent is included in file "settings_sent_domains.xlsx" of the backup production.
[4] Cookie "ug1" is set by www.ugdturner.com, which appears to be part of Turner Broadcasting System, Inc., the owner of CNN.
[5] Details on certain cookie values transmitted to Google-associated domains are noted in Appendix F.

Source:
[1] Network transmission data.

CONFIDENTIAL – SUBJECT TO PROTECTIVE ORDER

Exhibit 2.18: Comparison of Cookie Values Transmitted to Google Domains
uBlock Extension Test
Chrome Browser Tested on Windows 10 in Regular Browsing Mode
https://www.apartments.com/

Cookie Name	uBlock Disabled	uBlock Enabled
IDE	AHWqTUnPoC9ZcjLX3rBJP1dmBdlYnu	
_ga	***2136294989.1649106224***	
_gcl_au	***2140085877.1649106224***	
_gid	***71093476.1649106224***	
test_cookie	CheckForPermission	

Notes:
[1] Only the first 30 characters of a cookie value or URL parameter sent to Google-associated domains are displayed. The full value is included in file "settings_full_value.xlsx" of the backup production.
[2] ***Bold, italicized*** cookie names and values denote first-party cookies.
[3] The Google-associated domain that each cookie value is sent is included in file "settings_sent_domains.xlsx" of the backup production.
[4] Details on certain cookie values transmitted to Google-associated domains are noted in Appendix F.

Source:
[1] Network transmission data.

Exhibit 2.19: Comparison of Cookie Values Transmitted to Google Domains
uBlock Extension Test
Chrome Browser Tested on Windows 10 in Regular Browsing Mode
https://www.latimes.com/

Cookie Name	uBlock Disabled	uBlock Enabled
CMID	YktrAIIf3Zd5iNP2SiHpqAAA	
DSID	NO_DATA	
IDE	AHWqTUmfYMJH7_jyOL__9TCchFnGXO	
TDID	025216e0-ff41-4fd3-a113-c87854	
	ID=a60a78df2b4d7cfa-224aa90cef	
__gads	***ID=a60a78df2b4d7cfa:T=16491097***	
__uis	b8071472-7593-4c4a-a903-279140	
_ga	***2132850896.1649109759***	
_gid	***2118316826.1649109760***	
ssh	triplelift	
test_cookie	CheckForPermission	
ttd	025216e0-ff41-4fd3-a113-c87854	
uid-bp-892	025216e0-ff41-4fd3-a113-c87854	
uuid	***a872e0ba-bcde-44ef-b6ae-a5ba54***	

Notes:
[1] Only the first 30 characters of a cookie value or URL parameter sent to Google-associated domains are displayed. The full value is included in file "settings_full_value.xlsx" of the backup production.
[2] ***Bold, italicized*** cookie names and values denote first-party cookies.
[3] The Google-associated domain that each cookie value is sent is included in file "settings_sent_domains.xlsx" of the backup production.
[4] Details on certain cookie values transmitted to Google-associated domains are noted in Appendix F.

Source:
[1] Network transmission data.

Exhibit 2.20: Comparison of Cookie Values Transmitted to Google Domains
uBlock Extension Test
Chrome Browser Tested on Windows 10 in Regular Browsing Mode
https://www.washingtonpost.com/

Cookie Name	uBlock Disabled	uBlock Enabled
CMID	Ykt.RiKyIVI68lkLc3ltFgAA	
DSID	NO_DATA	
IDE	AHWqTUmVj-VjMQZ8aD41TxtACOsH_O	
__gads	***ID=f8245f857df1b360-22937904ef*** ***ID=f8245f857df1b360:T=16491146***	
_ga	***632871189.1649114693***	
_ga_WRCN68Y2 LD	***1649114692***	
_gaexp	***3gY8TfBUQy645wcR55Xl0w.0***	
_gid	***372893291.1649114693***	
test_cookie	CheckForPermission	
wp_ak_subs	0|20220331	
wp_ak_v_m	***0|20220331***	
wp_geo	***US|VA|511||***	
wp_usp	***1---***	

Notes:
[1] Only the first 30 characters of a cookie value or URL parameter sent to Google-associated domains are displayed. The full value is included in
[2] ***Bold, italicized*** cookie names and values denote first-party cookies.
[3] The Google-associated domain that each cookie value is sent is included in file "settings_sent_domains.xlsx" of the backup production.
[4] Details on certain cookie values transmitted to Google-associated domains are noted in Appendix F.

Source:
[1] Network transmission data.

CONFIDENTIAL – SUBJECT TO PROTECTIVE ORDER

Exhibit 2.21: Comparison of Cookie Values Transmitted to Google Domains
Cookie Blocking Test
Chrome Browser Tested on Windows 10 in Private Browsing Mode
https://www.nytimes.com/

Cookie Name	All Cookies Allowed	Third-Party Cookies Blocked	All Cookies Blocked
CMID	YkSm6cGa8vBVshi-1svQ5AAA		
IDE	AHWqTUkIT-yqMsUNu3cbkrW3r4Htdq		
NID	511=E6GMvYAlEN_gpE_wCyehptITCz		
TDID	fea87c34-72ba-4e52-8034-66aa66		
__gads	***ID=3bc9fc006ac6d5ba-22941fdf12*** ***ID=3bc9fc006ac6d5ba:T=16486663***	***ID=3c96f2ea57947042-2249e2afe4***	
_ga	***1608007200.1648666345***	***1838268510.1648666801***	
_gcl_au	***1380625421.1648666346***	***157853512.1648666802***	
_gid	***1052484163.1648666346***	***619398206.1648666802***	
nyt-a	***Ag3lx0c716TuLX0Wf6jid2***	***8Rls1jZfEdlyWm-M5VB98t***	
nyt-jkidd	***anon***	***anon***	
test_cookie	CheckForPermission		

Notes:
[1] Only the first 30 characters of a cookie value or URL parameter sent to Google-associated domains are displayed. The full value is included in file "settings_full_value.xlsx" of the backup production.
[2] ***Bold, italicized*** cookie names and values denote first-party cookies.
[3] The Google-associated domain that each cookie value is sent is included in file "settings_sent_domains.xlsx" of the backup production.
[4] Details on certain cookie values transmitted to Google-associated domains are noted in Appendix F.

Source:
[1] Network transmission data.

Exhibit 2.22: Comparison of Cookie Values Transmitted to Google Domains
Cookie Blocking Test
Chrome Browser Tested on Windows 10 in Private Browsing Mode
https://www.cnn.com/

Cookie Name	All Cookies Allowed	Third-Party Cookies Blocked	All Cookies Blocked
CMID	YkOY8S14hoZyRefj4pJ27wAA		
DSID	NO_DATA	NO_DATA	
IDE	AHWqTUlDhvnsjX9rw3qdlu0e6RqoWd		
V		HOmxJXMhswcM	
__gads	***ID=3eb5ab291c6b5b44-22bdec2a10*** ***ID=3eb5ab291c6b5b44:T=16485972***	***ID=1e2d765b0fbeab4a:T=16485977***	
indxexcg	YkOY8S14hoZyRefj4pJ27wAAA8kAAA		
test_cookie	CheckForPermission		
ug	***624398ed0cef2f0a3f9b5b0016a2c3***	***62439ae900f8050a3f85a100173520***	
ug1	***624398ed0cef2f0a3f9b5b0016a2c3***	***62439ae900f8050a3f85a100173520***	

Notes:
[1] Only the first 30 characters of a cookie value or URL parameter sent to Google-associated domains are displayed. The full value is included in file "settings_full_value.xlsx" of the backup production.
[2] ***Bold, italicized*** cookie names and values denote first-party cookies.
[3] The Google-associated domain that each cookie value is sent is included in file "settings_sent_domains.xlsx" of the backup production.
[4] Cookie "ug1" is set by www.ugdturner.com, which appears to be part of Turner Broadcasting System, Inc., the owner of CNN.
[5] Details on certain cookie values transmitted to Google-associated domains are noted in Appendix F.

Source:
[1] Network transmission data.

Exhibit 2.23: Comparison of Cookie Values Transmitted to Google Domains
Cookie Blocking Test
Chrome Browser Tested on Windows 10 in Private Browsing Mode
https://www.apartments.com/

Cookie Name	All Cookies Allowed	Third-Party Cookies Blocked	All Cookies Blocked
IDE	AHWqTUkPbb2UC8BHZKez6UJYfwWCar		
TDID	d076f26e-7627-40ee-b467-b52ec6		
_ga	***472975019.1648608753***	***1733023998.1648609275***	
_gcl_au	***1583386961.1648608754***	***1736737948.1648609275***	
_gid	***420769323.1648608753***	***2027979523.1648609275***	
test_cookie	CheckForPermission		

Notes:
[1] Only the first 30 characters of a cookie value or URL parameter sent to Google-associated domains are displayed. The full value is included in file "settings_full_value.xlsx" of the backup production.
[2] ***Bold, italicized*** cookie names and values denote first-party cookies.
[3] The Google-associated domain that each cookie value is sent is included in file "settings_sent_domains.xlsx" of the backup production.
[4] Details on certain cookie values transmitted to Google-associated domains are noted in Appendix F.

Source:
[1] Network transmission data.

Exhibit 2.24: Comparison of Cookie Values Transmitted to Google Domains
Cookie Blocking Test
Chrome Browser Tested on Windows 10 in Private Browsing Mode
https://www.latimes.com/

Cookie Name	All Cookies Allowed	Third-Party Cookies Blocked	All Cookies Blocked
CMID	YkTDtIS-ihY3vf6uYAWLvAAA		
DSID	NO_DATA	NO_DATA	
IDE	AHWqTUlOb8GMSb6siXdw21AtjQLFMO		
TDID	7dceb479-b2b4-4cae-a8b0-d185e2		
__gads	***ID=28131598daf97978-22a072a6e4***	***ID=c7d409668150a0fb-22636d5513***	
__uis	75271540-1260-4982-83d8-e9aca9		
_ga	***1248574119.1648673716***	***1173847638.1648674216***	
_gid	***1259003467.1648673716***	***1397726901.1648674217***	
_rxuuid	AYg5qPJGHaE5RMRghcVF_0ZyoZPsRV AYg5qPJ0SD_m6nQPo5rT-Vyrnoqc5K		
google_push	AYg5qPL2QduhQQE3oHFbhQvqbI9ivz AYg5qPJo9WJdRJdOaYRXuwAeQN8OZq		
ljt_reader	b80ed4f7864894252f7b05b1		
permutive-id	***74f04ab6-e373-4380-ac5c-f2b695***	***282078e5-2c9f-4363-a1ef-4acd31***	
sa-user-id-v2	NXPuFFGjSPJ_m-PWFUOHaBTnUu4		
ssh	triplelift		
suid	5943A252DD7143BAB83FF9326084B7		
suid_legacy	5943A252DD7143BAB83FF9326084B7		
test_cookie	CheckForPermission		
uuid	***d3d51d00-18c7-4a02-91f1-94b062***	***aba50388-dce8-49d9-9bda-83a543***	

Notes:
[1] Only the first 30 characters of a cookie value or URL parameter sent to Google-associated domains are displayed. The full value is included in file "settings_full_value.xlsx" of the backup production.
[2] ***Bold, italicized*** cookie names and values denote first-party cookies.
[3] The Google-associated domain that each cookie value is sent is included in file "settings_sent_domains.xlsx" of the backup production.
[4] Details on certain cookie values transmitted to Google-associated domains are noted in Appendix F.

Source:
[1] Network transmission data.

CONFIDENTIAL – SUBJECT TO PROTECTIVE ORDER

Exhibit 2.25: Comparison of Cookie Values Transmitted to Google Domains
Cookie Blocking Test
Chrome Browser Tested on Windows 10 in Private Browsing Mode
https://www.washingtonpost.com/

Cookie Name	All Cookies Allowed	Third-Party Cookies Blocked	All Cookies Blocked
CMID	YkTOfQQp2SdTVT3cJA5OWwAA		
DSID	NO_DATA	NO_DATA	
IDE	AHWqTUlll7nlxljrl1oi9QVtssikcp		
TDID	ff574a88-7f6b-4e6c-80d1-da6d01		
__gads	***ID=6dc3dcbe2105f2af-22bcd07913*** ***ID=6dc3dcbe2105f2af:T=16486764***	***ID=dd603e395fd45b34-228b18c0e4***	
_ga	***1297367007.1648676476***	***921166568.1648676776***	
_ga_WRCN68Y2LD	***1648676475***	***1648676775***	
_gaexp	***3gY8TfBUQy645wcR55Xl0w.0***	***3gY8TfBUQy645wcR55Xl0w.0***	
_gid	***481785167.1648676476***	***394318624.1648676776***	
test_cookie	CheckForPermission		
wp_geo	***US|VA|511||***	***US|VA|511||***	
wp_usp	***1---***	***1---***	

Notes:
[1] Only the first 30 characters of a cookie value or URL parameter sent to Google-associated domains are displayed. The full value is included in file "settings_full_value.xlsx" of the backup production.
[2] ***Bold, italicized*** cookie names and values denote first-party cookies.
[3] The Google-associated domain that each cookie value is sent is included in file "settings_sent_domains.xlsx" of the backup production.
[4] Details on certain cookie values transmitted to Google-associated domains are noted in Appendix F.

Source:
[1] Network transmission data.

Exhibit 2.26: Comparison of Cookie Values Transmitted to Google Domains
JavaScript Blocking Test
Chrome Browser Tested on Windows 10 in Default Private Browsing Mode with Third-Party Cookies Blocked
https://www.nytimes.com/

Cookie Name	JavaScript Enabled	Sybu Enabled	JavaScript Disabled
__gads	***ID=3c96f2ea57947042-2249e2afe4***		
_ga	***1838268510.1648666801***		
_gcl_au	***157853512.1648666802***		
_gid	***619398206.1648666802***		
nyt-a	***8Rls1jZfEdlyWm-M5VB98t***		
nyt-jkidd	***anon***		

Notes:
[1] Only the first 30 characters of a cookie value or URL parameter sent to Google-associated domains are displayed. The full value is included in file “settings_full_value.xlsx” of the backup production.
[2] ***Bold, italicized*** cookie names and values denote first-party cookies.
[3] The Google-associated domain that each cookie value is sent is included in file “settings_sent_domains.xlsx” of the backup production.
[4] Details on certain cookie values transmitted to Google-associated domains are noted in Appendix F.

Source:
[1] Network transmission data.

CONFIDENTIAL – SUBJECT TO PROTECTIVE ORDER

Exhibit 2.27: Comparison of Cookie Values Transmitted to Google Domains
JavaScript Blocking Test
Chrome Browser Tested on Windows 10 in Default Private Browsing Mode with Third-Party Cookies Blocked
https://www.cnn.com/

Cookie Name	JavaScript Enabled	Sybu Enabled	JavaScript Disabled
DSID	NO_DATA		
V	HOmxJXMhswcM		
__gads	***ID=1e2d765b0fbeab4a:T=16485977***		
ug	***62439ae900f8050a3f85a100173520***		
ug1	***62439ae900f8050a3f85a100173520***		

Notes:
[1] Only the first 30 characters of a cookie value or URL parameter sent to Google-associated domains are displayed. The full value is included in file "settings_full_value.xlsx" of the backup production.
[2] ***Bold, italicized*** cookie names and values denote first-party cookies.
[3] The Google-associated domain that each cookie value is sent is included in file "settings_sent_domains.xlsx" of the backup production.
[4] Cookie "ug1" is set by www.ugdturner.com, which appears to be part of Turner Broadcasting System, Inc., the owner of CNN.
[5] Details on certain cookie values transmitted to Google-associated domains are noted in Appendix F.

Source:
[1] Network transmission data.

CONFIDENTIAL – SUBJECT TO PROTECTIVE ORDER

Exhibit 2.28: Comparison of Cookie Values Transmitted to Google Domains
JavaScript Blocking Test
Chrome Browser Tested on Windows 10 in Default Private Browsing Mode with Third-Party Cookies Blocked
https://www.apartments.com/

Cookie Name	JavaScript Enabled	Sybu Enabled	JavaScript Disabled
_ga	***1733023998.1648609275***		
_gcl_au	***1736737948.1648609275***		
_gid	***2027979523.1648609275***		

Notes:
[1] Only the first 30 characters of a cookie value or URL parameter sent to Google-associated domains are displayed. The full value is included in file “settings_full_value.xlsx” of the backup production.
[2] ***Bold, italicized*** cookie names and values denote first-party cookies.
[3] The Google-associated domain that each cookie value is sent is included in file “settings_sent_domains.xlsx” of the backup production.
[4] Details on certain cookie values transmitted to Google-associated domains are noted in Appendix F.

Source:
[1] Network transmission data.

CONFIDENTIAL – SUBJECT TO PROTECTIVE ORDER

Exhibit 2.29: Comparison of Cookie Values Transmitted to Google Domains
JavaScript Blocking Test
Chrome Browser Tested on Windows 10 in Default Private Browsing Mode with Third-Party Cookies Blocked
https://www.latimes.com/

Cookie Name	JavaScript Enabled	Sybu Enabled	JavaScript Disabled
DSID	NO_DATA		
__gads	***ID=c7d409668150a0fb-22636d5513***		
_ga	***1173847638.1648674216***		
_gid	***1397726901.1648674217***		
permutive-id	***282078e5-2c9f-4363-a1ef-4acd31***		
uuid	***aba50388-dce8-49d9-9bda-83a543***		

Notes:
[1] Only the first 30 characters of a cookie value or URL parameter sent to Google-associated domains are displayed. The full value is included in file "settings_full_value.xlsx" of the backup production.
[2] ***Bold, italicized*** cookie names and values denote first-party cookies.
[3] The Google-associated domain that each cookie value is sent is included in file "settings_sent_domains.xlsx" of the backup production.
[4] Details on certain cookie values transmitted to Google-associated domains are noted in Appendix F.

Source:
[1] Network transmission data.

Exhibit 2.30: Comparison of Cookie Values Transmitted to Google Domains
JavaScript Blocking Test
Chrome Browser Tested on Windows 10 in Default Private Browsing Mode with Third-Party Cookies Blocked
https://www.washingtonpost.com/

Cookie Name	JavaScript Enabled	Sybu Enabled	JavaScript Disabled
DSID	NO_DATA		
__gads	***ID=dd603e395fd45b34-228b18c0e4***		
_ga	***921166568.1648676776***		
_ga_WRCN68Y2 LD	***1648676775***		
_gaexp	***3gY8TfBUQy645wcR55Xl0w.0***		
_gid	***394318624.1648676776***		
wp_geo	***US|VA|511||***		
wp_usp	***1---***		

Notes:
[1] Only the first 30 characters of a cookie value or URL parameter sent to Google-associated domains are displayed. The full value is included in file "settings_full_value.xlsx" of the backup production.
[2] ***Bold, italicized*** cookie names and values denote first-party cookies.
[3] The Google-associated domain that each cookie value is sent is included in file "settings_sent_domains.xlsx" of the backup production.
[4] Details on certain cookie values transmitted to Google-associated domains are noted in Appendix F.

Source:
[1] Network transmission data.

Exhibit 2.31: Comparison of Cookie Values Transmitted to Google Domains
Google Analytics Opt-Out Extension Test
Chrome Browser Tested on Windows 10 in Default Private Browsing Mode with Third-Party Cookies Blocked
https://www.nytimes.com/

Cookie Name	Google Analytics Opt-Out Disabled	Google Analytics Opt-Out Enabled
__gads	***ID=3c96f2ea57947042-2249e2afe4***	***ID=9dcbd1eb652322be-22e80ec926***
_ga	***1838268510.1648666801***	
_gcl_au	***157853512.1648666802***	***1589155738.1649656530***
_gid	***619398206.1648666802***	
nyt-a	***8Rls1jZfEdlyWm-M5VB98t***	***BPayFwhF7hj0avAC05npjS***
nyt-jkidd	***anon***	

Notes:
[1] Only the first 30 characters of a cookie value or URL parameter sent to Google-associated domains are displayed. The full value is included in file "settings_full_value.xlsx" of the backup production.
[2] ***Bold, italicized*** cookie names and values denote first-party cookies.
[3] The Google-associated domain that each cookie value is sent is included in file "settings_sent_domains.xlsx" of the backup production.
[4] Details on certain cookie values transmitted to Google-associated domains are noted in Appendix F.

Source:
[1] Network transmission data.

Exhibit 2.32: Comparison of Cookie Values Transmitted to Google Domains
Google Analytics Opt-Out Extension Test
Chrome Browser Tested on Windows 10 in Default Private Browsing Mode with Third-Party Cookies Blocked
https://www.cnn.com/

Cookie Name	Google Analytics Opt-Out Disabled	Google Analytics Opt-Out Enabled
DSID	NO_DATA	
V	HOmxJXMhswcM	tBZBxoJtH4fe
__gads	***ID=1e2d765b0fbeab4a:T=16485977***	***ID=50cdc1fcbd2f7e90-22ab1f2e28***
__gpi		***UID=000004690a9dbf40:T=1649653***
ug	***62439ae900f8050a3f85a100173520***	***6253b8880da7500a3f9b5b00181a23***
ug1	***62439ae900f8050a3f85a100173520***	***6253b8880da7500a3f9b5b00181a23***

Notes:
[1] Only the first 30 characters of a cookie value or URL parameter sent to Google-associated domains are displayed. The full value is included in file "settings_full_value.xlsx" of the backup production.
[2] ***Bold, italicized*** cookie names and values denote first-party cookies.
[3] The Google-associated domain that each cookie value is sent is included in file "settings_sent_domains.xlsx" of the backup production.
[4] Cookie "ug1" is set by www.ugdturner.com, which appears to be part of Turner Broadcasting System, Inc., the owner of CNN.
[5] Details on certain cookie values transmitted to Google-associated domains are noted in Appendix F.

Source:
[1] Network transmission data.

Exhibit 2.33: Comparison of Cookie Values Transmitted to Google Domains
Google Analytics Opt-Out Extension Test
Chrome Browser Tested on Windows 10 in Default Private Browsing Mode with Third-Party Cookies Blocked
https://www.apartments.com/

Cookie Name	Google Analytics Opt-Out Disabled	Google Analytics Opt-Out Enabled
_ga	***1733023998.1648609275***	
_gcl_au	***1736737948.1648609275***	***1489613522.1649652675***
_gid	***2027979523.1648609275***	

Notes:
[1] Only the first 30 characters of a cookie value or URL parameter sent to Google-associated domains are displayed. The full value is included in file “settings_full_value.xlsx” of the backup production.
[2] ***Bold, italicized*** cookie names and values denote first-party cookies.
[3] The Google-associated domain that each cookie value is sent is included in file “settings_sent_domains.xlsx” of the backup production.
[4] Details on certain cookie values transmitted to Google-associated domains are noted in Appendix F.

Source:
[1] Network transmission data.

Exhibit 2.34: Comparison of Cookie Values Transmitted to Google Domains
Google Analytics Opt-Out Extension Test
Chrome Browser Tested on Windows 10 in Default Private Browsing Mode with Third-Party Cookies Blocked
https://www.latimes.com/

Cookie Name	Google Analytics Opt-Out Disabled	Google Analytics Opt-Out Enabled
DSID	NO_DATA	
__gads	***ID=c7d409668150a0fb-22636d5513***	***ID=7346b03642f9b0f7:T=16496552***
_ga	***1173847638.1648674216***	
_gid	***1397726901.1648674217***	
permutive-id	***282078e5-2c9f-4363-a1ef-4acd31***	***c26699b9-978b-4fe5-b0ec-df3241***
uuid	***aba50388-dce8-49d9-9bda-83a543***	***0a3efc60-5d68-40b8-a8cb-067e74***

Notes:
[1] Only the first 30 characters of a cookie value or URL parameter sent to Google-associated domains are displayed. The full value is included in file "settings_full_value.xlsx" of the backup production.
[2] ***Bold, italicized*** cookie names and values denote first-party cookies.
[3] The Google-associated domain that each cookie value is sent is included in file "settings_sent_domains.xlsx" of the backup production.
[4] Details on certain cookie values transmitted to Google-associated domains are noted in Appendix F.

Source:
[1] Network transmission data.

Exhibit 2.35: Comparison of Cookie Values Transmitted to Google Domains
Google Analytics Opt-Out Extension Test
Chrome Browser Tested on Windows 10 in Default Private Browsing Mode with Third-Party Cookies Blocked
https://www.washingtonpost.com/

Cookie Name	Google Analytics Opt-Out Disabled	Google Analytics Opt-Out Enabled
DSID	NO_DATA	
__gads	***ID=dd603e395fd45b34-228b18c0e4***	***ID=2509e86e03197d5d-222a606927***
_ga	***921166568.1648676776***	
_ga_WRCN68Y2LD	***1648676775***	
_gaexp	***3gY8TfBUQy645wcR55Xl0w.0***	
_gid	***394318624.1648676776***	
wp_geo	***US|VA|511||***	
wp_usp	***1---***	***1---***

Notes:
[1] Only the first 30 characters of a cookie value or URL parameter sent to Google-associated domains are displayed. The full value is included in file "settings_full_value.xlsx" of the backup production.
[2] ***Bold, italicized*** cookie names and values denote first-party cookies.
[3] The Google-associated domain that each cookie value is sent is included in file "settings_sent_domains.xlsx" of the backup production.
[4] Details on certain cookie values transmitted to Google-associated domains are noted in Appendix F.

Source:
[1] Network transmission data.

Exhibit 2.36: Comparison of Cookie Values Transmitted to Google Domains
uBlock Extension Test
Chrome Browser Tested on Windows 10 in Default Private Browsing Mode with Third-Party Cookies Blocked
https://www.nytimes.com/

Cookie Name	uBlock Disabled	uBlock Enabled
__gads	***ID=3c96f2ea57947042-2249e2afe4***	
_ga	***1838268510.1648666801***	
_gcl_au	***157853512.1648666802***	
_gid	***619398206.1648666802***	
nyt-a	***8Rls1jZfEdlyWm-M5VB98t***	
nyt-jkidd	***anon***	

Notes:
[1] Only the first 30 characters of a cookie value or URL parameter sent to Google-associated domains are displayed. The full value is included in file "settings_full_value.xlsx" of the backup production.
[2] ***Bold, italicized*** cookie names and values denote first-party cookies.
[3] The Google-associated domain that each cookie value is sent is included in file "settings_sent_domains.xlsx" of the backup production.
[4] Details on certain cookie values transmitted to Google-associated domains are noted in Appendix F.

Source:
[1] Network transmission data.

Exhibit 2.37: Comparison of Cookie Values Transmitted to Google Domains
uBlock Extension Test
Chrome Browser Tested on Windows 10 in Default Private Browsing Mode with Third-Party Cookies Blocked
https://www.cnn.com/

Cookie Name	uBlock Disabled	uBlock Enabled
DSID	NO_DATA	
V	HOmxJXMhswcM	
__gads	***ID=1e2d765b0fbeab4a:T=16485977***	
ug	***62439ae900f8050a3f85a100173520***	
ug1	***62439ae900f8050a3f85a100173520***	

Notes:
[1] Only the first 30 characters of a cookie value or URL parameter sent to Google-associated domains are displayed. The full value is included in file "settings_full_value.xlsx" of the backup production.
[2] ***Bold, italicized*** cookie names and values denote first-party cookies.
[3] The Google-associated domain that each cookie value is sent is included in file "settings_sent_domains.xlsx" of the backup production.
[4] Cookie "ug1" is set by www.ugdturner.com, which appears to be part of Turner Broadcasting System, Inc., the owner of CNN.
[5] Details on certain cookie values transmitted to Google-associated domains are noted in Appendix F.

Source:
[1] Network transmission data.

Exhibit 2.38: Comparison of Cookie Values Transmitted to Google Domains
uBlock Extension Test
Chrome Browser Tested on Windows 10 in Default Private Browsing Mode with Third-Party Cookies Blocked
https://www.apartments.com/

Cookie Name	uBlock Disabled	uBlock Enabled
_ga	***1733023998.1648609275***	
_gcl_au	***1736737948.1648609275***	
_gid	***2027979523.1648609275***	

Notes:
[1] Only the first 30 characters of a cookie value or URL parameter sent to Google-associated domains are displayed. The full value is included in file "settings_full_value.xlsx" of the backup production.
[2] ***Bold, italicized*** cookie names and values denote first-party cookies.
[3] The Google-associated domain that each cookie value is sent is included in file "settings_sent_domains.xlsx" of the backup production.
[4] Details on certain cookie values transmitted to Google-associated domains are noted in Appendix F.

Source:
[1] Network transmission data.

Exhibit 2.39: Comparison of Cookie Values Transmitted to Google Domains
uBlock Extension Test
Chrome Browser Tested on Windows 10 in Default Private Browsing Mode with Third-Party Cookies Blocked
https://www.latimes.com/

Cookie Name	uBlock Disabled	uBlock Enabled
DSID	NO_DATA	
__gads	***ID=c7d409668150a0fb-22636d5513***	
_ga	***1173847638.1648674216***	
_gid	***1397726901.1648674217***	
permutive-id	***282078e5-2c9f-4363-a1ef-4acd31***	
uuid	***aba50388-dce8-49d9-9bda-83a543***	

Notes:
[1] Only the first 30 characters of a cookie value or URL parameter sent to Google-associated domains are displayed. The full value is included in file “settings_full_value.xlsx” of the backup production.
[2] ***Bold, italicized*** cookie names and values denote first-party cookies.
[3] The Google-associated domain that each cookie value is sent is included in file “settings_sent_domains.xlsx” of the backup production.
[4] Details on certain cookie values transmitted to Google-associated domains are noted in Appendix F.

Source:
[1] Network transmission data.

Exhibit 2.40: Comparison of Cookie Values Transmitted to Google Domains
uBlock Extension Test
Chrome Browser Tested on Windows 10 in Default Private Browsing Mode with Third-Party Cookies Blocked
https://www.washingtonpost.com/

<table>
<tr><th>Cookie Name</th><th>uBlock Disabled</th><th>uBlock Enabled</th></tr>
<tr><td>DSID</td><td>NO_DATA</td><td></td></tr>
<tr><td>__gads</td><td>ID=dd603e395fd45b34-228b18c0e4</td><td></td></tr>
<tr><td>_ga</td><td>921166568.1648676776</td><td></td></tr>
<tr><td>_ga_WRCN68Y2LD</td><td>1648676775</td><td></td></tr>
<tr><td>_gaexp</td><td>3gY8TfBUQy645wcR55Xl0w.0</td><td></td></tr>
<tr><td>_gid</td><td>394318624.1648676776</td><td></td></tr>
<tr><td>wp_geo</td><td>US|VA|511||</td><td></td></tr>
<tr><td>wp_usp</td><td>1---</td><td></td></tr>
</table>

Notes:
[1] Only the first 30 characters of a cookie value or URL parameter sent to Google-associated domains are displayed. The full value is included in file “settings_full_value.xlsx” of the backup production.
[2] ***Bold, italicized*** cookie names and values denote first-party cookies.
[3] The Google-associated domain that each cookie value is sent is included in file “settings_sent_domains.xlsx” of the backup production.
[4] Details on certain cookie values transmitted to Google-associated domains are noted in Appendix F.

Source:
[1] Network transmission data.

Georgios Zervas

Boston University
Questrom School of Business
595 Commonwealth Ave (Ofc. 605)
Boston, MA 02215

Phone: (617) 358-3319 (office)
Email: zg@bu.edu
Homepage: http://people.bu.edu/zg/
Google Scholar: https://scholar.google.com/citations?user=5L8vEA4AAAAJ

Last updated: Dec. 21, 2021

Employment & Affiliations

Current

Associate Professor of Marketing 2019–to date
Questrom School of Business, Boston University, Boston, MA

Faculty Director, MS in Business Analytics 2019–to-date
Questrom School of Business, Boston University, Boston, MA

Founding Member, Faculty of Computing & Data Science 2019–to date
Boston University, Boston, MA

Affiliated Faculty in Computer Science 2016–to date
Boston University, Boston, MA

Visiting Researcher 2013–to date
Microsoft Research New England, Cambridge, MA

Prior

Assistant Professor of Marketing 2013–2019
Questrom School of Business, Boston University, Boston, MA

Visiting Scholar Spring 2018
MIT Sloan, Cambridge, MA

Simons Postdoctoral Fellow 2011–2013
Yale University, New Haven, CT
Advisor: Joan Feigenbaum

Affiliate at the Center for Research & Computation in Society 2011–2013
Harvard University, Cambridge, MA

Research Scientist 2006–2012
CogoLabs Inc., Cambridge, MA, USA

Cofounder 2000–2005
Perlfect Solutions, London, UK

Education

Ph.D. Computer Science 2005–2011
Boston University, Boston, MA, USA.
Thesis: Data-Driven Analysis of Electronic Commerce Systems.
Advisors: John W. Byers (BU) & Michael Mitzenmacher (Harvard).

M.A. Interactive Media 1999–2000
London College of Communication, London, UK.
Thesis: Automatic Website Generation Using Genetic Algorithms.
Advisor: Alan Sekers.

M.Sc. Computer Science 1998–1999
Imperial College, London, UK.
Thesis: Thesis: Advanced Clustering Algorithms.
Advisor: Stefan Rüger.

B.Eng. Computer Science 1995–1998
Imperial College, London, UK.
Thesis: Object Linking & Embedding for Linux.
Advisor: Steffen van Bakel.

Publications

Journals

1. Shrabastee Banerjee, Chris Dellarocas Chris, and Georgios Zervas
   Interacting User-Generated Content Technologies: How Questions and Answers Affect Consumer Reviews.
   Journal of Marketing Research, (2021);58(4): 742-761.

2. Georgios Zervas, Davide Proserpio, and John W. Byers
   A first look at online reputation on Airbnb, where every stay is above average
   Marketing Letters, (2020): 1-16.

3. Giana Eckhardt, Mark Houston, Baojun Jiang, Cait Lamberton, Aric Rindfleisch, and Georgios Zervas
   Marketing in the Sharing Economy
   Journal of Marketing, 83.5 (2019): 5-27.

4. Giana Eckhardt, Mark Houston, Baojun Jiang, Cait Lamberton, Aric Rindfleisch, and Georgios Zervas
   Marketing in the Sharing Economy
   Journal of Marketing, 83.5 (2019): 5-27.

5. Davide Proserpio, Wendy Xu, and Georgios Zervas
   You Get What You Give: Theory and Evidence of Reciprocity in the Sharing Economy
   Quantitative Marketing and Economics, 16(4), (2018): 371-407.

6. Georgios Zervas, Davide Proserpio, and John W. Byers
   The Rise of the Sharing Economy: Estimating the Impact of Airbnb on the Hotel Industry
   Journal of Marketing Research, 54, no. 5 (2017): 687-705.
   – Finalist for the 2018 Paul E. Green Award.

7. Davide Proserpio and Georgios Zervas
Online Reputation Management: Estimating the Impact of Management Responses on Consumer Reviews
Marketing Science, 36, no. 5 (2017): 645-665
– Finalist for the 2018 John D. C. Little Award.

8. Michael Luca, and Georgios Zervas
Fake It Till You Make It: Reputation, Competition, and Yelp Review Fraud
Management Science, 62, no. 12 (2016): 3412-3427

Full Papers in Peer-reviewed Conferences with Proceedings

1. Ceren Budak, Sharad Goel, Justin M. Rao, and Georgios Zervas
Understanding Emerging Threats to Online Advertising
In *Proceedings of the Sixteenth ACM Conference on Economics and Computation (EC '16)*. ACM, 2016.

2. John Byers, Michael Mitzenmacher, and Georgios Zervas
The Daily Deals Marketplace: Empirical Observations and Managerial Implications
In *ACM SIGecom Exchanges, Vol. 11, No. 2, December 2012, Pages 29–31*.

3. Joan Feigenbaum, Michael Mitzenmacher, and Georgios Zervas
An Economic Analysis of User-Privacy Options in Ad-Supported Services
In *Proceedings of the 8th Workshop on Internet & Network Economics*, WINE '12, pages 30–43. Springer Berlin Heidelberg, 2012.

4. John W. Byers, Michael Mitzenmacher, and Georgios Zervas
The Groupon Effect on Yelp Ratings: A Root Cause Analysis
In *Proceedings of the 13th ACM Conference on Electronic Commerce*, EC '12, pages 248–265. Valencia, Spain, 2012. ACM.

5. John W. Byers, Michael Mitzenmacher, and Georgios Zervas
Daily Deals: Prediction, Social Diffusion, and Reputational Ramifications
In *Proceedings of the 5th ACM international conference on Web Search and Data Mining*, WSDM '12, pages 543–552. Seattle, WA, USA, 2012. ACM.

6. John W. Byers, Brent Heeringa, Michael Mitzenmacher, and Georgios Zervas.
Heapable Sequences and Subsequences
In *Proceedings of the Workshop on Analytic Algorithmics and Combinatorics*, ANALCO '11, pages 33–44, San Fransisco, CA, USA, 2011. ACM.

7. John W. Byers, Michael Mitzenmacher, and Georgios Zervas
Information asymmetries in pay-per-bid auctions
In *Proceedings of the 11th ACM conference on Electronic Commerce*, EC '10, pages 1–12, New York, NY, USA, 2010. ACM.

8. John W. Byers, Michael Mitzenmacher, and Georgios Zervas
Adaptive Weighing Designs for Keyword Value Computation
In *Proceedings of the third ACM international conference on Web search and data mining*, WSDM '10, pages 331–340, New York, NY, USA, 2010. ACM.

9. Nikolaos Laoutaris, Georgios Zervas, Azer Bestavros, and George Kollios
The Cache Inference Problem and its Application to Content and Request Routing
In *Proceedings of the 26th Annual IEEE Conference on Computer Communications*, INFOCOM '07, pages 848–856, Anchorage, AK, USA, 2007. IEEE.

10. Georgios Zervas, and Stefan M. Rüger
The Curse of Dimensionality and Document Clustering
In *IEEE Seminar, Searching for Information: Artificial Intelligence and Information Retrieval Approaches*, pages 19/1–19/3, Glasgow, UK, 1999.

Abstracts in Peer-reviewed Conferences with Proceedings

1. Greg Lewis and Georgios Zervas
The Supply and Demand Effects of Review Platforms
In *Proceedings of the 2019 ACM Conference on Economics and Computation (EC '19).*, pp. 197-197. ACM, 2019.

2. Shrabastee Banerjee, Chris Dellarocas, and Georgios Zervas
Interacting User Generated Content Technologies: How Q&As Affect Ratings & Reviews
In *Proceedings of the 2017 ACM Conference on Economics and Computation (EC '17).*, pp. 539-539. ACM, 2017.

3. Georgios Zervas, Davide Proserpio, and John W. Byers
The Impact of the Sharing Economy on the Hotel Industry: Evidence from Airbnb's Entry Into the Texas Market
In *Proceedings of the 2015 ACM Conference on Economics and Computation (EC '15).*, pp. 637-637. ACM, 2015.

4. Davide Proserpio and Georgios Zervas
Online Reputation Management: Estimating the Impact of Management Responses on Consumer Reviews
In *Proceedings of the 2015 ACM Conference on Economics and Computation (EC '15).*, pp. 79-79. ACM, 2015.

Invited Articles

1. Davide Proserpio and Georgios Zervas
Replying to Customer Reviews Results in Better Ratings
Harvard Business Review, Feb. 14, 2018.

Working Papers

1. Greg Lewis, Bora Ozaltun, and Georgios Zervas
Maximum Likelihood Estimation of Differentiated Products Demand Systems

2. Luis Armona, Greg Lewis, and Georgios Zervas
Learning Product Characteristics and Consumer Preferences from Search Data

3. Stephan Seiler, Song Yao, Georgios Zervas
Causal Inference in Word-of-Mouth Research: Methods and Results

4. Chiara Farronato and Georgios Zervas
Consumer Reviews and Regulation: Evidence from NY Restaurants

5. Greg Lewis and Georgios Zervas
The Welfare Impact of Consumer Reviews: A Case Study of the Hotel Industry

6. Greg Lewis and Georgios Zervas
Supply and Demand Responses to Consumer Review Platforms

Grants, Awards, & Honors

1. Marketing Science Institute (MSI) Young Scholars 2019
2. Dean's Research Scholar, Questrom School of Business 08/2018
3. Shahdadpuri Research Award, Questrom School of Business 10/2017
4. Hariri Institute Graduate Fellowship 6/2015
   ($25,000 award)
5. Google Faculty Research Award 2/2015
   ($35,000 unrestricted gift, plus $10,000 in Google Cloud credits)
6. Hariri Institute Junior Faculty Fellow 2013–2015
7. Hariri Institute Research Grant 1/2013
   Principal Investigator, with co-PI John W. Byers ($26,500)
8. Departmental Research Achievement Award, Computer Science Dept., Boston U. 2010–2011

Student Advising

1. Hannah Catabia, PhD Student, Computer Science Dept., Co-advisor 2019–to date
2. Philip Zhao, PhD Student, Marketing Dept., Advisor 2018–to date
3. Shrabastee Banerjee, PhD Student, Marketing Dept., Advisor 2015–2021
   Placement: Tilburg University, Marketing
4. Davide Proserpio, PhD Student, Computer Science Dept., Co-advisor 2012–2015
   Placement: USC Marshall, Marketing

Presentations and Invited Talks

Learning Market Structure & Consumer Preferences from Search Data: An Application to Hotel Demand Estimation

Conferences:
- Marketing Science 2019, Rome, Italy 06/20/2019

Consumer Reviews and Regulation: Evidence from NY Restaurants

Academia:
- Technische Universität Berlin, Germany 10/04/2021
- Universitat zu Koln, Germany 07/31/2021
- Brandeis University, Walthman, MA 04/07/2021
- Yale School of Management, New Haven, CT 10/30/2020
- University of Miami, Miami, FL 10/23/2020
- UMass Amherst Isenberg School of Management, Amherst, MA 02/03/2018

Conferences:
- Marketing Science 2018, Philadelphia, PA 06/14/2018

- BU Data Science Day, Boston University, Boston MA	01/26/2018
- Digital, Mobile Marketing, and Social Media Analytics Conference, NYU, New York, NY	09/12/2017
- Marketing Science, USC Marshall, Los Angeles, CA	06/10/2017
- Health Sector Data Blitz, Questom School of Business, Boston, MA	03/11/2017
- Marketing Analytics and Big Data conference, Columbia University, New York, NY	16/09/2017

The Welfare Impact of Consumer Reviews: A Case Study of the Hotel Industry

Academia:

- HEC, Paris, France	11/07/2019
- Duke Fuqua, Durham, North Carolina	05/01/2019
- Harvard Business School, Boston, MA	03/12/2019
- NYU Stern, New York, NY	02/14/2019
- Columbia GSB, New York, NY	10/16/2018
- USC Marshall, Los Angeles, CA	4/14/2017
- Stanford GSB, Palo Alto, CA	4/12/2017
- Michigan Ross, Ann Arbon, MI	4/10/2017
- University of Toronto Rotman, Toronto, ON	2/17/2017
- University of Chicago Booth, Chicago, IL	1/31/2017
- Wharton, Philadelphia, PA	1/25/2017
- MIT Economics Dept., Cambridge, MA	10/24/2016

Conferences:

- QME 2016, Kellogg School of Management, Evanston, IL	09/01/2016
- SCECR 2016, Naxos, Greece	06/24/2016
- Greater China Conference on Mobile Big Data Marketing, Hong Kong	06/13/2016
- Marketing Science 2016, Shanghai, China	06/16/2016

Online Reputation Management: Estimating the Impact of Management Responses on Consumer Reviews.

Academia:

- Havard EconCS Seminar, Cambridge, MA	10/02/2015
- Hebrew University, Computer Science dept., Jerusalem, Israel	06/14/2015

The Rise of the Sharing Economy: Estimating the Impact of Airbnb on the Hotel Industry

Conferences:

- Open & User Innovation Conference 2015, Harvard Business School, Boston MA	08/03/2016
- CODE@MIT, Cambridge MA	10/16/2015
- Marketing Science 2015, Baltimore	05/20/2015
- NYU 2015 Conference on Digital Big Data, Smart Life, Mobile Marketing Analytics	23/10/2015

Academia:

- Simon Business School, University of Rochester	2/29/2016

Industry:

- Microsoft Research New England	11/18/2015

Government:

- Cambridge City Council, Cambridge, MA 7/19/2016

Understanding Emerging Threats to Online Advertising

Academia:

- Goizueta Business School, Emory University 02/27/2015
- MSR/Harvard Game Theory Seminar 12/17/2014
- Questrom School of Business, MPPL Seminar 04/17/2015

Industry:

- Betaworks, NYC 07/23/2015

Fake It Till You Make It: Reputation, Competition, and Yelp Review Fraud

Conferences:

- Marketing Science 2014, Emory University, Atlanta 06/13/2014
- WIN 2013: The 5th Workshop on Information in Networks 10/04/2013
- DIMACS Workshop on Economic Aspects of Information Sharing 02/08/2013

Industry:

- Google, Palo Alto, CA 02/12/2013

The Groupon Effect on Yelp Ratings: A Root Cause Analysis

Conferences:

- Marketing Science 2013, Istanbul, Turkey 07/13/2013
- SCECR 2012, Montreal, Canada 06/29/2012
- ACM EC 2012, Valencia, Spain 06/05/2012
- Yale Customer Insights Conference, New Haven, CT 03/15/2013
- CAOSS 2012: Workshop on Computational and Online Social Science, New York, NY 10/12/2012

Academia:

- Wellesley University, Computer Science Dept 02/27/2012
- Northeastern University, Computer Science Dept 03/28/2012
- Harvard University, School of Eng. & Appl. Sci., Joint EconCS/Theory Seminar 04/16/2012
- Berkeley University, Computer Science Dept 04/10/2012

Industry:

- Microsoft Research New York 02/27/2013
- Google, Palo Alto, CA 04/09/2012
- Yelp, San Francisco, CA 04/11/2012

Daily Deals: Prediction, Social Diffusion, and Reputational Ramifications

Conferences:

- New York Computer Science and Economics Day (*Poster session.*) 09/16/2011
- Cambridge Area Economics and Computation Day (*Poster session.*) 11/18/2011
- ACM WSDM 2012 02/11/2012

Academia:
- Harvard University, School of Eng. & Appl. Sci., Joint EconCS/Theory Seminar 10/20/2011
- Boston University, Mathematics Dept., Statistics and Probability Seminar 11/17/2011
- Columbia University, Computer Science Dept., Seminar 12/08/2011

Industry:
- IBM Research, Hawthorne, NY, Seminar 12/07/2011
- Microsoft Research New England, Economics Research Working Group 10/14/2011

Information Asymmetries in Pay-Per-Bid Auctions: How Swoopo Makes Bank

Conferences:
- ACM EC 2010 06/09/2010

Academia:
- Boston University, Computer Science Dept., Theory Seminar 03/19/2010
- Harvard University, School of Eng. & Appl. Sci., Joint EconCS/Theory Seminar 03/29/2010
- Northeastern University, Coll. of Comp. & Inf. Sci., Graduate Student Seminar 04/03/2010
- Williams College, Computer Science Dept., Invited Colloquium 10/22/2010

Adaptive Weighing Designs for Keyword Value Computation

Conferences:
- ACM WSDM 2010 02/06/2010

Academia:
- Boston University, Computer Science Dept., Networking Reading Group 02/08/2010
- Boston University, Computer Science Dept., CS565 Data Mining, Guest Lecture 03/23/2010

Teaching

1. BA810: Supervised Machine Learning (44 students) Fall 2019
2. BA810: Supervised Machine Learning (42 students) Fall 2019
3. MK476: Machine Learning for Business Analytics (26 students) Spring 2019
4. MK824: Machine Learning for Business Analytics (44 students) Spring 2019
5. MK824: Machine Learning for Business Analytics (40 students) Spring 2018
6. MK824: Machine Learning for Business Analytics (43 students) Spring 2017
7. MK323: Marketing Management (49 students) Spring 2017
8. MK323: Marketing Management (48 students) Fall 2015
9. MK323: Marketing Management (50 students) Fall 2015
10. MK323: Marketing Management (47 students) Fall 2014
11. MK323: Marketing Management (47 students) Fall 2014
12. MK323: Marketing Management (49 students) Fall 2013
13. MK323: Marketing Management (50 students) Fall 2013

Course Development

MK476, **MK842**, and **BA810** are courses that I developed that introduce undergraduate, MBA, and MSBA students to machine learning methods with applications in business analytics.

Service

Editorial Review Board 2020–to-date
Marketing Science

Steering Committee Member 2019–to-date
Rafik B. Hariri Institute for Computing, Boston University

Editorial Review Board 2019–to-date
Journal of Marketing

Editorial Review Board 2019–to-date
Journal of Marketing Research

Associate Editor 2019–to date
ACM Transactions on Economics and Computation

Program committees: EC 2021 (Program Committee), EC 2020 (Senior Program Committee), WebConf 2020, EC 2019 (Senior Program Committee), EC 2018 (Senior Program Committee), EC 2018, WWW 2018, ICIS 2018, EC 2017 (Senior Program Committee), EC 2016 (Senior Program Committee), WWW 2016 (Senior Program Committee), ICIS 2016, SCECR 2016, EC 2015, WSDM 2015, WWW 2015, AMMA 2015, COBE 2015, EC 2014, WSDM 2014, WWW 2014, ICWSM 2014, WWW 2013, WSDM 2013, EC 2012.

Ad-hoc reviewer: Management Science, Marketing Science, Journal of Marketing Research, Information Systems Research, Games and Economic Behavior, Review of Industrial Organization, Operations Letters, Management Information Systems Quarterly, Journal of Public Economics, Manufacturing & Service Operations Management.

Media coverage

1. Some Smiling Faces in Online Customer Testimonials Are Stock Photos 05/16/2019
   The Wall Street Journal
2. Why ranting on Yelp is the wrong way to complain about awful service 04/03/2018
   The Boston Globe
3. Does a 'Sharing Economy' Foster Better Behavior? 03/27/2018
   PC Magazine
4. For Hotels, Online Reviews Really Matter to the Bottom Line 11/18/2016
   The Wall Street Journal
5. Don't Necessarily Judge Your Next E-Book By Its Online Review 10/26/2015
   NPR All Things Considered
6. Five-star fakes 10/24/2015
   The Economist

7. Ratings Now Cut Both Ways, So Don't Sass Your Uber Driver — 01/30/2015
   The New York Times
8. Airbnb, Uber, Lyft: de l'économie collaborative au business du partage — 08/16/2014
   Le nouvel Observateur
9. Airbnb versus hotels: Room for all, for now — 04/26/2014
   The Economist
10. Keeping crowdsourcing honest: can we trust the reviews? — 02/18/2014
    BBC News
11. Why It's So Hard to Figure Out the Sharing Economy's Winners and Losers — 02/10/2014
    The Atlantic Cities
12. Sharing Is Caring, Unless It Costs You Your Job — 02/05/2014
    The New York Times Bits Blog
13. Yelp Reviews: Can You Trust Them? — 11/04/2013
    BU Today
14. Fake reviews on Yelp?! Don't worry, we've got your back — 09/27/2013
    Yelp Official Blog
15. Yelp deems 20% of user reviews 'suspicious' — 09/24/2013
    Marketwatch, The Wall Street Journal
16. Yelp admits a quarter of submitted reviews could be fake — 09/13/2013
    BBC News
17. Underdog Businesses Are More Likely to Post Fake Yelp Reviews — 08/30/2013
    Harvard Business Review Blog Network
18. How Good Groupon Leads to Bad Yelp — 03/11/2013
    The Freaknomics Blog
19. For Some Businesses, Daily Deals Have A Dark Side — 07/06/2012
    NPR Morning Edition
20. Using Groupon Deals? Your Yelp Rating May Suffer — 04/11/2012
    The Huffington Post
21. Help for Yelp — 11/09/2011
    BU Today
22. Groupon IPO: An Internet star falls to Earth — 10/23/2011
    Christian Science Monitor
23. Is Groupon Bad For Business? — 10/18/2011
    WBUR
24. Groupon: Bad for Business? — 10/05/2011
    BU Today
25. Groupon's Morning After Problem — 10/04/2011
    Time Magazine

26. Coupon Sites Are a Great Deal, but Not Always to Merchants 10/02/2011
The New York Times
27. Groupon Deals May Hurt Your Yelp Ratings 09/12/2011
The Atlantic
28. Study: Daily Deals Hurt Businesses' Reputations 07/06/2011
The Wall Street Journal, "In Charge" blog
29. Groupon's Hidden Influence on Reputation 09/12/2011
The MIT Technology Review

APPENDIX B

LIST OF PRIOR EXPERT TESTIMONY FOR DR. GEORGIOS ZERVAS

Calhoun et al. v. Google LLC, *U.S. District Court for the Northern District of California – San Jose Division*, Case No. 5:20-cv-05146

Expert Report (December 2021) and Deposition Testimony (January 2022).

Appendix C

Materials Considered

Case Documents

Third Amended Class Action Complaint, *Chasom Brown, et al., v. Google LLC, United States District Court Northern District of California*, February 3, 2022.

Deposition of AbdelKarim Mardini Volume I, November 23, 2021.

Deposition of AbdelKarim Mardini Volume II, November 24, 2021.

Deposition of Glenn Berntson Volume I, March 18, 2022.

Deposition of Huei-Hung (Chris) Liao Volume I, December 2, 2021.

Deposition of Huei-Hung (Chris) Liao Volume II, December 3, 2021.

Deposition of Michael Kleber, March 18, 2022.

Deposition of Rory McClelland, February 18, 2022.

Deposition of Stephen Chung 30(b)(6), March 10, 2022.

Deposition of Steve Ganem, February 11, 2022.

Deposition of Steve Ganem, March 23, 2022.

Deposition of Wing Pan "Bert" Leung, March 4, 2022.

Academic Literature

Kurose, James F. & Ross, Keith W., "Computer Networking: A Top-Down Approach," 8th Edition, Pearson, 2021.

Garett, Renee et al., "A Literature Review: Website Design and User Engagement," *Online journal of communication and media technologies*, Vol. 6,3 (2016): 1-14, available at https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4974011/.

Rodden, Kerry et al., "Measuring the User Experience on a Large Scale: User-Centered Metrics for Web Applications," *ACM Press*, April 2010, available at https://static.googleusercontent.com/media/research.google.com/en//pubs/archive/36299.pdf.

Publicly Available Sources

"[GA4] Activate Google signals for Google Analytics 4 properties," *Analytics Help*, *Google*, available at https://support.google.com/analytics/answer/9445345?hl=en.

"[GA4] Link Google Ads and Analytics," *Analytics Help*, *Google*, available at https://support.google.com/analytics/answer/9379420?hl=en.

"[GA4] Measure activity across platforms," *Analytics Help*, *Google*, available at https://support.google.com/analytics/answer/9213390?hl=en.

"A beginner's guide to programmatic advertising," *Amazon Ads*, *Amazon*, March 11, 2021, available at https://advertising.amazon.com/blog/programmatic-advertising.

"About Advertising Features," *Analytics Help*, *Google*, available at https://support.google.com/analytics/answer/3450482.

"About Google Tag Manager," *Tag Manager*, *Google*, available at https://developers.google.com/tag-platform/tag-manager.

"About privacy & messaging," *Google Ad Manager Help*, *Google*, available at https://support.google.com/admanager/answer/10075997?hl=en.

"About publisher provided identifiers," *Google Ad Manager Help*, *Google*, available at https://support.google.com/admanager/answer/2880055?hl=en.

"About the IETF," *Internet Society*, available at https://www.internetsociety.org/about-the-ietf/.

"About the User-ID feature," *Analytics Help*, *Google*, https://support.google.com/analytics/answer/3123662#zippy=%2Cin-this-article.

"Activate Google signals," *Analytics Help*, *Google*, available at https://support.google.com/analytics/answer/7532985#zippy=%2Cin-this-article.

"Ad Choices for the Google Display Network," *Google Ad Manager Help*, *Google*, available at https://support.google.com/admanager/answer/2695279?hl=en.

"Ad personalization settings in Google's publisher ad tags," *Google Ad Manager Help*, *Google*, available at https://support.google.com/admanager/answer/7678538.

"Ad selection white paper," *Google Ad Manager Help*, *Google*, available at https://support.google.com/admanager/answer/1143651#zippy=%2Csummary-of-data-types-table.

"Ad sizes," *Google Publisher Tag*, *Google*, available at https://developers.google.com/publisher-tag/guides/ad-sizes.

"AdBlock –- best ad blocker," *Chrome Web Store*, *Google*, available at https://chrome.google.com/webstore/detail/adblock-%E2%80%94-best-ad-blocker/gighmmpiobklfepjocnamgkkbiglidom?hl=en-US.

"AdButler," *AdButler*, available at https://www.adbutler.com/.

"Add gtag.js to your site," *Google Analytics*, *Google*, available at https://developers.google.com/analytics/devguides/collection/gtagjs.

"AdGuard" *AdGuard*, available at https://adguard.com/en/welcome.html.

"Advertising with Google Ad Manager," *Google Ad Manager Help*, *Google*, available at https://support.google.com/admanager/answer/6022000?hl=en.

"Allow private browsing," *Chrome Enterprise and Education Help, Google,* available at https://support.google.com/chrome/a/answer/9302896?hl=en.

"Analytics anywhere in the customer journey," *Adobe Analytics*, *Adobe*, available at https://www.adobe.com/analytics/adobe-analytics.html.

"Analyze the customer journey across websites and apps," *PIWIK PRO*, available at https://piwik.pro/.

"APIs: The Proven Tool for Efficient Business Growth," *Axos Bank*, July 1, 2020, available at https://www.axosbank.com/blog/APIs-The-Proven-Tool-for-Efficient-Business-Growth#.

"Block certain ads,"*Ads Help*, *Google*, available at https://support.google.com/ads/answer/2662922?hl=en.

"Browse in private," *Google Chrome Help*, *Google*, available at https://support.google.com/chrome/answer/95464?hl=en&co=GENIE.Platform%3DDesktop.

"Browse InPrivate in Microsoft Edge," *Microsoft Support*, *Microsoft*, available at https://support.microsoft.com/en-us/microsoft-edge/browse-inprivate-in-microsoft-edge-cd2c9a48-0bc4-b98e-5e46-ac40c84e27e2.

"Build Better Products," *Mixpanel*, available at https://mixpanel.com/.

"Choose your privacy settings," *Google Chrome Help*, *Google*, available at https://support.google.com/chrome/answer/114836?hl=en&co=GENIE.Platform%3DDesktop.

"Chrome DevTools," *Chrome Developers*, *Google*, available at https://developer.chrome.com/docs/devtools/.

"Client-side Storage," *World Wide Web Consortium*, available at https://www.w3.org/2001/tag/2010/09/ClientSideStorage.html.

"Common Myths about Private Browsing," *Support Mozilla, Mozilla*, available at https://support.mozilla.org/en-US/kb/common-myths-about-private-browsing?as=u&utm_source=inproduct.

"Computer Cookies: What They Are and How They Work," *HP Tech Takes*, November 26, 2018, available at https://www.hp.com/us-en/shop/tech-takes/what-are-computer-cookies.

"Consent Mode," *Analytics Help*, *Google*, available at https://support.google.com/analytics/answer/9976101?hl=en.

"Cookie Rejection Report 2020," *Flashtalking*, available at https://static1.squarespace.com/static/5c17fee58ab722e19b765b9d/t/5ebb2cad66d47b4c5c9f21a9/1589324990858/Flashtalking_Cookie_Rejection_Report_2020.pdf.

"Cookies and user identification with gtag.js," *Google Analytics*, *Google*, available at https://developers.google.com/analytics/devguides/collection/gtagjs/cookies-user-id.

"Cookies and User Identification," *Google Analytics*, *Google*, available at https://developers.google.com/analytics/devguides/collection/analyticsjs/cookies-user-id.

"cookies and website data," *Apple Support*, *Apple*, available at https://support.apple.com/guide/safari/aside/glos0126d795/15.1/mac/12.0.

"Disable Google Analytics measurement," *Google Analytics*, *Google*, available at https://developers.google.com/analytics/devguides/collection/gtagjs/user-opt-out.

"Disable JavaScript in Chrome, Edge, Firefox, Opera, Internet Explorer on Windows 11/10," *The Windows Club*, available at https://www.thewindowsclub.com/disable-javascript-chrome-ie-firefox-opera.

"Does firefox prevent sites and javascript code from accessing existing cookies and web sites data when browsing in Private Browsing mode?" *Support Mozilla, Mozilla Corporation*, February 24, 2019, available at https://support.mozilla.org/en-US/questions/1251227.

"Does Safari Web Extensions include Private Browsing?" *Developer Forums, Apple*, available at https://developer.apple.com/forums/thread/650294.

"Download NordVPN app for Windows PC," *NordVPN*, available at https://nordvpn.com/download/windows/.

"Enable Google signed-in, cross-device personalized ads," *Google Ad Manager Help*, *Google*, available at https://support.google.com/admanager/answer/7204537?hl=en.

"Enable Remarketing and Avertising Reporting Features in Analytics," *Analytics Help*, *Google*, available at https://support.google.com/analytics/answer/2444872.

"Extensions in Private Browsing," *Support Mozilla*, *Mozilla*, available at https://support.mozilla.org/en-US/kb/extensions-private-browsing.

"Facebook Advertisers: Direct vs Programmatic Buying Trends," *MediaRadar*, May 27, 2021, available at https://mediaradar.com/blog/facebook-advertisers-direct-vs-programmatic/.

"Get started with ads in Google Ad Manager," *Google Ad Manager Help*, *Google,* available at https://support.google.com/admanager/answer/6027116?hl=en&ref_topic=7506292.

"Get Started with Google Publisher Tags," *Google Publisher Tag*, *Google*, available at https://developers.google.com/publisher-tag/guides/get-started.

"Google Analytics 4 SDK, and User ID Feature Policy," *Analytics Help*, *Google*, available at https://developers.google.com/analytics/devguides/collection/ga4/policy.

"Google Analytics 4 tags," *Tag Manager Help, Google*, available at https://support.google.com/tagmanager/answer/9442095.

"Google Analytics alternative that protects your data and your customers' privacy," *Matomo*, available at https://matomo.org/.

"Google Analytics Cookie Usage on Websites," *Google Analytics, Google*, https://developers.google.com/analytics/devguides/collection/gtagjs/cookie-usage.

"Google Analytics Opt-out Add-on (by Google)," *Chrome Web Store*, *Google*, available at https://chrome.google.com/webstore/detail/google-analytics-opt-out/fllaojicojecljbmefodhfapmkghcbnh?hl=en.

"Google Analytics Opt-out Browser Add-on," *Google Tools*, *Google*, available at https://tools.google.com/dlpage/gaoptout/.

"Google Analytics Terms of Service," *Google Marketing Platform, Google*, available at https://marketingplatform.google.com/about/analytics/terms/us/.

"Google and TCF 2.0: how to collect consent for personalized ads," *iubenda*, available at https://www.iubenda.com/en/help/16041-google-tcf-consent-personalized-ads.

"Google Chrome Privacy Notice," *Google Chrome*, *Google*, September 23, 2021, available at https://www.google.com/chrome/privacy/.

"Google Publisher Policies," *Google Ad Manager Help*, *Google*, available at https://support.google.com/admanager/answer/10502938?visit_id=637746843701355304-1137658824&rd=1#privacy.

"Growing your business with APIs.," *Visa*, available at https://usa.visa.com/content/dam/VCOM/download/partner-with-us/growing-business-api-whitepaper.pdf

"Guide to Third-party Cookies," *CookieYes*, March 24, 2022, available at https://www.cookieyes.com/blog/third-party-cookies/.

"Hello Analytics API: JavaScript quickstart for web applications," *Google Analytics*, *Google*, available at https://developers.google.com/analytics/devguides/config/mgmt/v3/quickstart/web-js.

"How Chrome Incognito keeps your browsing private," *Google Chrome Help*, *Google*, available at https://support.google.com/chrome/answer/9845881.

"How do I turn on the Do Not Track feature," *Support Mozilla*, *Mozilla Corporation*, available at https://support.mozilla.org/en-US/kb/how-do-i-turn-do-not-track-feature.

"How Google Uses Cookies," *Google Privacy & Terms*, *Google*, available at https://policies.google.com/technologies/cookies?hl=en-US.

"How Google uses information from sites or apps that use our services," *Google Privacy & Terms, Google*, available at https://policies.google.com/technologies/partner-sites.

"How often do you use a VPN?" *Statista*, available at https://www.statista.com/statistics/1219770/virtual-private-network-use-frequency-us-uk/.

"How private browsing works in Chrome," *Google Chrome Help*, *Google*, available at https://support.google.com/chrome/answer/7440301?hl=en.

"How private browsing works," *Google*, archived by the *Wayback Machine*, May 03, 2020, available at https://web.archive.org/web/20200503180118/https://support.google.com/chrome/?p=incognito.

"HTTP Request Methods," *W3 Schools*, available at https://www.w3schools.com/tags/ref_httpmethods.asp.

"HTTP Status Messages," *W3 Schools*, available at https://www.w3schools.com/tags/ref_httpmessages.asp.

"IBA Opt-out (by Google), *Chrome Web Store*, *Google*, available at https://chrome.google.com/webstore/detail/iba-opt-out-by-google/gbiekjoijknlhijdjbaadobpkdhmoebb?hl=en.

"Incognito browser: What it really means," Mozilla, available at https://www.mozilla.org/en-US/firefox/browsers/incognito-browser/.

"IP Anonymization (or IP masking) in Google Analytics," *Analytics Help*, *Google*, available at https://support.google.com/analytics/answer/2763052.

"IPv4 and IPv6 address formats," *IBM*, March 2, 2021, https://www.ibm.com/docs/en/ts3500-tape-library?topic=functionality-ipv4-ipv6-address-formats.

"Learn about Google Analytics," *Google Analytics*, *Google*, accessed March 22, 2022, available at https://developers.google.com/analytics/devguides/platform.

"Limited Ads," *Google Ad Manager Help*, *Google,* available at https://support.google.com/admanager/answer/9882911.

"Manage my Browser's Opt Outs," *NAI*, available at https://thenai.org/opt-out/.

"Manage user privacy," *Tags*, *Google*, available at https://developers.google.com/tag-platform/devguides/privacy.

"Manage your cookies and site data," *Google,* archived by the *Wayback Machine*, May 17, 2013, available at https://web.archive.org/web/20130517102706/https://support.google.com/chrome/answer/95647?hl=en#.

"Measurement Protocol, SDK, and User ID Feature Policy," *Google Analytics*, *Google*, available at https://developers.google.com/analytics/devguides/collection/protocol/ga4/policy.

"Measurement Protocol, SDK, and User ID Feature Policy," *Google Analytics*, *Google,* available at https://developers.google.com/analytics/devguides/collection/protocol/policy.

"Migrate from analytics.js to gtag.js (Universal Analytics)," *Google Analytics*, *Google*, available at https://developers.google.com/analytics/devguides/migration/ua/analyticsjs-to-gtagjs.

"OpenX," *OpenX*, available at https://www.openx.com/.

"Personalized and non-personalized ads," *Google Ad Manager Help*, *Google*, available at https://support.google.com/admanager/answer/9005435.

"Policy requirements for Google Analytics Advertising Features," *Analytics Help*, *Google*, available at https://support.google.com/analytics/answer/2700409.

"POST," *MDN Web Docs, Mozilla,* available at https://developer.mozilla.org/en-US/docs/Web/HTTP/Methods/POST.

"Restricted data processing (CCPA) settings in Google's publisher ad tags," *Google Ad Manager Help*, *Google*, available at https://support.google.com/admanager/answer/9598414#other-tags.

"Safeguarding your data," *Analytics Help*, *Google*, available at https://support.google.com/analytics/answer/6004245.

"Search & browse privately", *Google Search Help*, *Google*, available at https://support.google.com/websearch/answer/4540094?hl=en&co=GENIE.Platform%3DDesktop.

"Static vs. dynamic IP addresses," *Google Fiber Help*, *Google*, available at https://support.google.com/fiber/answer/3547208?hl=en

"Sybu JavaScript Blocker," *Chrome Web Store*, *Google*, available at https://chrome.google.com/webstore/detail/sybu-javascript-blocker/ceicidjdokcfbnkdenbhmnonehglgilk.

"Tag Manager overview," *Tag Manager Help*, *Google*, available at https://support.google.com/tagmanager/answer/6102821?hl=en.

"Tag," *At Internet*, available at https://www.atinternet.com/en/glossary/tag-3/.

"Temporarily allow cookies and site data in Microsoft Edge," *Microsoft Edge Support*, *Microsoft*, available at https://support.microsoft.com/en-us/microsoft-edge/temporarily-allow-cookies-and-site-data-in-microsoft-edge-597f04f2-c0ce-f08c-7c2b-541086362bd2.

"Three Ways APIs Are Keeping Small Businesses Digitally Competitive," *Small Business Trends*, February 10, 2022, available at https://smallbiztrends.com/2022/02/api-and-digital-transformation.html.

"Tracking prevention in Microsoft Edge," *Microsoft*, available at https://docs.microsoft.com/en-us/microsoft-edge/web-platform/tracking-prevention.

"Types of Network Protocols, Explained," *CDW Research Hub*, available at https://www.cdw.com/content/cdw/en/articles/networking/types-of-network-protocols.html.

"uBlock Origin," *Chrome Web Store*, *Google*, available at https://chrome.google.com/webstore/detail/ublock-origin/cjpalhdlnbpafiamejdnhcphjbkeiagm?hl=en.

"Understand how users behave on your site, what they need, and how they feel, fast," *Hotjar*, available at https://www.hotjar.com/.

"Universal Analytics will be going away," *Analytics Help*, *Google*, available at https://support.google.com/analytics/answer/11583528?hl=en.

"URIs, Addressability, and the use of HTTP GET and POST," *World Wide Web Consortium*, March 21, 2004, available at https://www.w3.org/2001/tag/doc/whenToUseGet.html#checklist.

"Use first-party cookies for programmatic frequency caps," *Google Ad Manager Help*, *Google*, available at https://support.google.com/admanager/answer/10650804?hl=en.

"Use Private Browsing in Safari on Mac," *Apple Support*, *Apple*, available at https://support.apple.com/guide/safari/browse-privately-ibrw1069/mac.

"User-ID limits," *Analytics Help*, *Google,* available at https://support.google.com/analytics/answer/3123668#zippy=%2Cin-this-article.

"Using HTTP cookies," *MDN Web Docs*, *Mozilla*, available at https://developer.mozilla.org/en-US/docs/Web/HTTP/Cookies.

"W3C TAG Observations on Private Browsing Modes," *World Wide Web Consortium*, April 9, 2020, available at https://w3ctag.github.io/private-browsing-modes/#evolving.

"What are cookies | Cookies definition," *Cloudflare*, available at https://www.cloudflare.com/learning/privacy/what-are-cookies/.

"What is a First-Party Cookie?" *CookiePro Knowledgebase*, September 17, 2021, available at https://www.cookiepro.com/knowledge/what-is-a-first-party-cookie/.

"What is Amazon DSP?" *Amazon Ads*, *Amazon*, available at https://advertising.amazon.com/solutions/products/amazon-dsp.

"What is JavaScript?" *MDN Web Docs*, *Mozilla Corporation*, available at https://developer.mozilla.org/en-US/docs/Learn/JavaScript/First_steps/What_is_JavaScript.

"Which Tracking Prevention Setting Should You Use in Microsoft Edge," *How-To Geek*, February 11, 2020, available at https://www.howtogeek.com/569951/which-tracking-prevention-setting-should-you-use-in-microsoft-edge/.

"XML HttpRequest," *W3 Schools*, available at https://www.w3schools.com/xml/xml_http.asp.

"XMLHttpRequest," *MDN Web Docs, Mozilla,* available at https://developer.mozilla.org/en-US/docs/Web/API/XMLHttpRequest.

Bacinger, Tomislav, "What is Bootstrap? A Short Bootstrap Tutorial on the What, Why, and How," *TopTotal*, available at https://www.toptal.com/front-end/what-is-bootstrap-a-short-tutorial-on-the-what-why-and-how.

Blumenthal, Eli, "Apple updates Safari on iOS to block third-party cookies," *CNET*, March 25, 2020, availible at https://www.cnet.com/tech/computing/apple-updates-safari-on-ios-and-mac-to-block-third-party-cookies/.

Cranor, Lorrie & Habib, Hana, "Private browsing: What it does - and doesn't do - to shield you from prying eyes on the web," *The Conversation*, July 30, 2020, available at https://theconversation.com/private-browsing-what-it-does-and-doesnt-do-to-shield-you-from-prying-eyes-on-the-web-142445.

Edelstein, Arthur, "Firefox 89 blocks cross-site cookie tracking by default in private browsing," *Mozilla Security Blog*, *Mozilla Corporation*, June 1, 2021, available at https://blog.mozilla.org/security/2021/06/01/total-cookie-protection-in-private-browsing/.

Finley, Klint, "I Turned Off JavaScript for a Whole Week and It Was Glorious," *Wired*, November 18, 2015, available at https://www.wired.com/2015/11/i-turned-off-javascript-for-a-whole-week-and-it-was-glorious/.

Herman, Scott, "Measure conversions while respecting user consent choices," *Google Marketing Platform*, *Google*, September 3, 2020, available at https://blog.google/products/marketingplatform/360/measure-conversions-while-respecting-user-consent-choices/.

Hodge, Rae, "If You Care About Your Privacy, You Need to Change These Browser Settings Right Now," *CNET*, February 26, 2022, available at https://www.cnet.com/tech/services-and-software/if-you-care-about-your-privacy-you-need-to-change-these-browser-settings-right-now/.

Hodge, Rae, Holly, Russell, & David Gewirtz, "Best VPN Service of 2022," *CNET*, March 26, 2022, available at https://www.cnet.com/tech/services-and-software/best-vpn/.

Hoffman, Chris, "What Is NoScript, and Should You Use It to Disable JavaScript?" *How-To Geek*, November 21, 2017, avaiable at https://www.howtogeek.com/138865/htg-explains-should-you-disable-javascript/.

Kopachovets, Oleg, "3rd Party API [Benefits, Our Experience, How-To]," *PRCoders,* October 6, 2021, available at https://procoders.tech/blog/how-to-integrate-third-party-api/.

Kyrnin, Jennifer, "Splash Pages: Pros and Cons," *ThoughtCo.*, February 25, 2021, available at https://www.thoughtco.com/splash-pages-pros-cons-3469116.

Mardini, AbdelKarim, "More intuitive privacy and security controls in Chrome," *The Keyword*, *Google*, May 19, 2020, available at https://blog.google/products/chrome/more-intuitive-privacy-and-security-controls-chrome/.

Patwegar, Waseem "How to Enable or Disable JavaScript In Chrome Browser," *Techbout*, available at https://www.techbout.com/enable-disable-javascript-chrome-36943/.

Paul, Ian, "How to automatically delete your cookies every time you close your broswer," *PC World,* November 11, 2014, available at https://www.pcworld.com/article/436317/how-to-automatically-delete-your-cookies-every-time-you-close-your-browser.html.

Prime, Joshua, "What is a Dynamic IP Address?" *OpenDNS*, available at https://support.opendns.com/hc/en-us/articles/227987827-What-is-a-Dynamic-IP-Address-.

Protalinski, Emil, "Chrome 83 arrives with redesigned security settings, third-party cookies blocked in Incognito," *VentureBeat*, May 19, 2020, available at https://venturebeat.com/2020/05/19/google-chrome-83/.

Spadafora, Anthony, "New Chrome build will allow you to block all cookies," *TechRadar*, March 17, 2020, available at https://www.techradar.com/news/new-chrome-build-will-allow-you-to-block-all-cookies,

Vrountas, Ted, "What Is Meta Pixel & What Does It Do?" *Instapage by Postclick*, February 14, 2022, available at https://instapage.com/blog/meta-pixel.

Zola, Andrew and Alexander S. Gillis, "network packet," *TechTarget*, available at https://www.techtarget.com/searchnetworking/definition/packet.

APPENDIX D

TESTING METHODOLOGY

1. This appendix describes technical details and testing methodology related to the analysis in my report.

I. PRIVATE BROWSING MODE FUNCTIONALITY TEST

2. To evaluate how data transmission differs between Regular and Private Browsing Modes, I accessed websites identified in the Complaint with testing variations in operating systems, browsers, and browsing modes. Websites mentioned in the Complaint include:[1]

- *https://www.nytimes.com/*
- *https://www.apartments.com/*
- *https://www.cnn.com/*
- *https://www.latimes.com/*
- *https://www.washingtonpost.com/*

3. I conducted tests on a variety of browser and operating system combinations:

a. On Windows 10 (version 20H2), I evaluated Chrome (version 100), Firefox (version 99), and Edge (version 100).

b. On macOS (version 12.2.1), I evaluated Chrome (version 100) and Safari (version 15).

c. On Android (version 12), I evaluated Chrome (version 100).

[1] I understand that Plaintiffs provide these websites as examples and that these websites do not constitute an exhaustive list of all websites Plaintiffs visited during the Class Period. Based on my professional experience, I understand the results I present in my report based on these five websites would be also applicable to a larger sample of websites that use Google Analytics and Google Ad Manager services.

d. On iOS (version 15.3.1), I evaluated Chrome (version 99) and Safari (version 15).

4. I used Fiddler Everywhere to record data transmission logs.[2] I followed a testing protocol as outlined below. The protocol is designed to (1) mimic a typical user's browsing behavior in that data are not cleared between browsing sessions, and (2) examine data transmitted during a Private Browsing Session as compared to a Regular Mode Session. I followed the steps described below for each website I visited in the respective browser-operating system variation:

a. Open browser in Regular Mode.

b. Clear all browsing data (i.e., cookies, caches, and other browser information).[3]

c. Check that default browser settings are in place (default cookie settings, all extensions disabled) by navigating to the respective settings pages.

d. Close the Regular Mode session.

e. "Regular Mode (Initial Session)" recording:

   i. Enable Fiddler Everywhere transmission recording.

   ii. Open browser in Regular Mode.

   iii. Copy the URL into the address bar.

   iv. Wait for all visible webpage elements to load and scroll to the bottom of the webpage.

---

2 Fiddler Everywhere is a software tool similar to Developer Tools in Chrome (which is a built-in Chrome browser feature). In contrast to Developer Tools, Fiddler Everywhere can capture HTTP transmissions irrespective of whether they occur as a result of web browsing or due to any other network transmission activity (e.g., other software running in the background such as Spotify). As my testing involved multiple browsers and operating systems, I used Fiddler Everywhere to record these tests in a consistent way.

3 Clearing browsing data before the start of each test serves the purpose of ensuring that all the data captured on the browser is directly related to my tests.

v. Close the browser and stop capturing transmissions.

f. "Regular Mode (Session 1)" recording:

i. Repeat steps in (e).

g. "Private Browsing Mode (Session 1)" recording:

i. Open the browser in private browsing mode.[4]

ii. Copy the URL into the address bar.

iii. Wait for all visible webpage elements to load and scroll to the bottom of the webpage.

h. Close the browser and stop capturing transmissions. "Private Browsing Mode (Session 2)" recording:

i. Repeat steps in (g).

i. "Regular Mode (Session 2)" recording:

i. Repeat steps in (e).

5. I saved the files in an HTTP Archive format (HAR files). I used the Python programming language to parse and analyze HAR files. My analysis focused on HTTP requests including and following the initial request to the website of interest (e.g., when accessing

[4] In Windows, I opened a Private Browsing Session in Chrome, Firefox, and Edge by right-clicking on the browser icon and selecting to open a Private Browsing Session (the exact phrase of the relevant option differs). For macOS, I opened a Safari Private Browsing Session by navigating to Preferences and changing the settings for "Safari opens with" from "A new window" to "A new private window." For Chrome in macOS, I was not able to open Incognito Mode directly as on Windows. Therefore, I opened Chrome on macOS by first opening a Regular Mode Session and then selecting to open an Incognito window through the browser menu. In this test case, I closed the Regular Mode Session before starting the Private Browsing Session. For iOS and Android, I opened a private browsing session by long-tapping the browser icon and selected the drop-down for a Private Browsing Session.

https://www.nytimes.com/, I analyze all requests starting from the request to *nytimes.com* domain) in order to exclude any automatic communications by the browsers that are not tied to Regular Mode or Private Browsing Sessions and are not directly associated with user browsing activity.

6. In my analysis, I focused on cookie values transmitted to Google-associated domains.[5] Cookie values may be transmitted in two ways. First, cookie values can be sent in an HTTP request header. Second, cookie values may be transmitted as part of a URL parameter.

7. To analyze cookie values transmitted as part of HTTP request headers sent to Google, I extracted all cookies sent under both "cookies" and "headers" fields in all HTTP requests to Google domains.

8. I also systematically analyzed parameter values contained in the URLs associated with Google domains. URL parameters have a standardized structure with a parameter key (name) and an associated value separated by an equal sign ("="). Key-value pairs for different URL parameters are separated by the "&" sign. As an example, the following URL with query string parameters can be found in the HAR file provided in my backup.[6] I highlighted keys with yellow color and associated values with blue color.

"url":

"https://mwcm.nytimes.com/capi/metered_assets/?plat=web&mc=0&mr=1&ma=

---

5 Similarly to my analysis in **Section IV**, I relied on the list of Google domains obtained from DuckDuckGo. https://github.com/duckduckgo/tracker-radar/blob/main/entities/Google%20LLC.json

6 File baseline0.har related to my testing of *https://www.nytimes.com/* in Chrome on Windows.

1&counted=false&granted=true&us=anon&context-type=&areas=barOne&areas=welcomeAd"

9. Although URL parameters can be used to transmit cookie values, they can also be used to transmit many other types of information unrelated to cookies. Therefore, not all parameters observed in a URL are associated with a cookie value. Further, even if cookie values are transmitted, the cookie name is not necessarily the same as the URL parameter name. Therefore, my approach to identify relevant URL parameters associated with cookie values is focused on analyzing transmitted values and matching them to the cookie values identified either in the request or response for all HTTP requests observed in the corresponding HAR file.

10. To identify potential cookie values that are passed through URL parameters, I first recorded all cookie values sent under both "cookies" and "headers" fields in the requests as well as cookies set under both "cookie" and "headers" fields in the responses (collectively referred to as "cookie values encountered") that I observed in a HAR file. I then analyzed all URL parameters that appear in the requests to Google-associated domains.[7]

11. For each URL parameter sent to a Google-associated domain, I looked for whether the value contained in the URL parameter is at least a substring of a value contained in an observed cookie value, or vice versa (whether a cookie value is at least a substring of any observed URL parameter). For example, if there was a URL parameter with value "369248429.1649093540", and there was a cookie value encountered with a value "GA1.2.369248429.1649093540," I identified

[7] File Fiddler Everywhere does not capture the contents of a browser's cookie jar. For scenarios where third-party cookies were blocked by default and were passed as a URL parameter to Google-associated domains, I further investigated these instances with the browser's developer tools to verify that the cookies were not set in the browser.

the URL parameter as a substring of the cookie value. If a parameter is not a substring of a cookie value and there is no cookie value that is a substring of the parameter, I excluded this parameter from further analysis.

12. Among the URL parameters that are identified as being a substring or having a substring among cookie values, I reviewed each case individually to determine whether the URL parameter indeed matches with the associated cookie value. For example, a URL parameter with value "1" would not be matched to a cookie value of "5299123"; however, I would identify "369248429.1649093540" in the URL parameter as a match with a cookie value of "GA1.2.369248429.1649093540". To limit the scope of this review, I did not perform this matching protocol for URL parameters and cookie values with a value length equal to or less than three characters. I also excluded from my analysis URL parameters with the following values: "true", "false", and "null."[8] I did not limit cookies I analyze based on the length of cookie value as these limitations only apply to matching cookies to respective URL parameters.

13. I provided the list of matches that I reviewed manually to determine if the matches are associated with transmitted cookies in backup production.

II. SETTINGS AND EXTENSIONS

14. In my experiments described in **Section V.D**, I included the same websites I studied in **Section IV** of my report:

- *https://www.nytimes.com/*
- *https://www.apartments.com/*
- *https://www.cnn.com/*

[8] I transformed values to lowercase to avoid case differences.

- *https://www.latimes.com/*
- *https://www.washingtonpost.com/*

15. I conducted all my tests using Chrome (version 100) on Windows 10 (version 20H2) to illustrate how the settings impact transmissions of At-Issue Data. Based on my professional experience with browsers and operating systems, similar types of browser settings and extensions are available on other browser-operating system pairs.

16. I tested the following settings in my report:

a. Cookie blocking: These tests include changing the cookie settings to: "Allow all cookies", "Block third-party cookies", and "Block all cookies" settings.

b. JavaScript: These tests include allowing JavaScript, changing the browser setting to block JavaScript, and using the Sybu extension to block JavaScript.

c. uBlock Origin extension: These tests include testing the uBlock Origin extension disabled and the uBlock Origin extension enabled.

d. Google Analytics Opt-out Add-on extension: These tests include testing the Google Analytics Opt-out Add-on disabled and Google Analytics Opt-out Add-on enabled.

17. In each of these tests except the Cookie blocking, I used the default cookie settings. In Regular Mode, Chrome allows all cookies. In Incognito Mode, third-party cookies are blocked by default.

18. I used Fiddler Everywhere to collect HTTP transmissions in both Regular and Private Browsing Modes following a testing protocol as outlined below. The procedure is repeated for all website-setting-mode combinations.

a. Open a browser instance in Regular Mode, clear browsing data (i.e., cookies and cache), and select the setting of interest.

b. Close the Regular Mode session.

c. Start recording data using Fiddler Everywhere and open a respective browsing mode session (Regular Mode or Private Browsing Mode, depending on the combination being tested).

   i. Regular Browsing Session is opened by clicking on the Chrome browser icon.

   ii. Private Browsing Session is opened by right-clicking on the Chrome browser icon and selecting "New Incognito window" to ensure a clean testing procedure.

d. Visit a website of interest by copying and pasting a respective URL to the address bar, wait until the website is finished loading, and scroll down to the bottom of the webpage.

e. Close the browsing session.

f. Stop data recording and save the associated network transmissions.

g. Close browser.

19. In my analysis, I followed the same procedure to identify cookie values that are transmitted to Google-associated domains as I described in **Section I** of this Appendix.

Appendix E.1: Comparison of Cookie Values Transmitted to Google Domains
Chrome Version 81 Tested on Windows 10
https://www.nytimes.com/

	Chrome				
Cookie Name	**Regular Mode (Initial Session)**	**Regular Mode (Session 1)**	**Private Browsing Mode (Session 1)**	**Private Browsing Mode (Session 2)**	**Regular Mode (Session 2)**
CMID	Ykz9qFbixl0zYMDlDVWocAAA		Ykz.tYt7nX6Cde0JMwdX0gAA	Ykz-XIudpbczrmBmwUNZPQAA	
DSID		NO_DATA		NO_DATA	NO_DATA
ID				c22f8f3ad7ec80601fa6b750a5d926	
IDE	AHWqTUky1u46zdsEaAU3deV8RhjnfR	AHWqTUky1u46zdsEaAU3deV8RhjnfR	AHWqTUkMJQWHRC_U5UKaCaKvAidt_5	AHWqTUlo0BFGBvY8aX3SeDQnI8K-s2	AHWqTUky1u46zdsEaAU3deV8RhjnfR
NID	511=fPz-VCYuOGvFUO5s9Nayx2WnTa	511=fPz-VCYuOGvFUO5s9Nayx2WnTa 511=tApLKj8lIIIlBi8g2-B6Uy9cDs	511=ExiiSvNJk-unGywfP29E6NTpo4	511=vkChIJSDR54ydhHjrATi-sz4b9	511=tApLKj8lIIIlBi8g2-B6Uy9cDs
TDID	809893ac-834c-43f9-a196-f08caf	809893ac-834c-43f9-a196-f08caf	939aa204-acac-468e-98e7-a48075		
__gads	***ID=7c31edb0b1f6b5fb-22f09af8f1*** ***ID=7c31edb0b1f6b5fb:T=16492128***	***ID=7c31edb0b1f6b5fb:T=16492128***	***ID=5698b91d4059c7fe-228446fbf1*** ***ID=5698b91d4059c7fe:T=16492131***	***ID=8d6f0de99d2245c2:T=16492132***	***ID=7c31edb0b1f6b5fb:T=16492128***
_ga	***1952030859.1649212839***	***1952030859.1649212839***	***1167649907.1649213107***	***792126254.1649213278***	***1952030859.1649212839***
_gcl_au	***1383473507.1649212840***	***1383473507.1649212840***	***1377810974.1649213109***	***1221338006.1649213279***	***1383473507.1649212840***
_gid	***332175566.1649212841***	***332175566.1649212841***	***786669721.1649213110***	***2061444676.1649213279***	***332175566.1649212841***
callback	AYg5qPIZZWZZeR6YI6IL1lliIo6e-3				
google_push				AYg5qPK2yaJBJma79bnzsijkiAvShp	
nyt-a	***s_0MdNi9p7xRpbq6xjM2up***	***s_0MdNi9p7xRpbq6xjM2up***	***ve6wR5qvDxVt9-VpZu8dNg***	***_vc--mENQ998zqoXeypKJ6***	***s_0MdNi9p7xRpbq6xjM2up***
nyt-jkidd	***anon***	***anon***	***anon***	***anon***	***anon***
sa-user-id-v2			LaVOXvuwQ6NlWm-zaUakQRQWv7E		
test_cookie	CheckForPermission		CheckForPermission	CheckForPermission	

Notes:
[1] Only the first 30 characters of a cookie value or URL parameter sent to Google-associated domains are displayed. The full value is included in file "os_full_value.xlsx" of the backup production.
[2] ***Bold, italicized*** cookie names and values denote first-party cookies.
[3] The Google-associated domain that each cookie value is sent is included in file "os_sent_domains.xlsx" of the backup production.
[4] The nyt-jkidd cookie is a first-party cookie with a long value. I observed a substring value of this long value, "anon", which matches a URL parameter sent to www.google-analytics.com. Since my exhibit shows only the substring value that was sent to Google-associated domains, I reviewed the full nyt-jkidd values across Regular and Private Browsing Mode and found that the values associated with the Private Browsing Mode were always different.
[5] Details on certain cookie values transmitted to Google-associated domains are noted in Appendix F.

Source:
[1] Network transmission data.

Appendix E.2: Comparison of Cookie Values Transmitted to Google Domains
Chrome Version 81 Tested on Windows 10
https://www.apartments.com/

	Chrome				
Cookie Name	**Regular Mode (Initial Session)**	**Regular Mode (Session 1)**	**Private Browsing Mode (Session 1)**	**Private Browsing Mode (Session 2)**	**Regular Mode (Session 2)**
IDE	AHWqTUnCq50dsrsWcWGiwNhje5QgTh	AHWqTUnCq50dsrsWcWGiwNhje5QgTh	AHWqTUkk6kuPFT9u9mawSGtpgV9Zrq	AHWqTUm6uOoYkj5acvi6yRqvrapSGi	AHWqTUnCq50dsrsWcWGiwNhje5QgTh
TDID	d88e9dd8-1d1e-4bdf-a7a0-a30d1d		32e6a398-a910-46e1-b68b-f733ca		
_ga	***783246969.1649208661***	***783246969.1649208661***	***435644190.1649208788***	***1588341551.1649208869***	***783246969.1649208661***
_gcl_au	***512778226.1649208661***	***512778226.1649208661***	***1516401421.1649208789***	***825676942.1649208869***	***512778226.1649208661***
_gid	***619666159.1649208661***	***619666159.1649208661***	***134384889.1649208788***	***1758351473.1649208869***	***619666159.1649208661***
test_cookie	CheckForPermission		CheckForPermission	CheckForPermission	

Notes:
[1] Only the first 30 characters of a cookie value or URL parameter sent to Google-associated domains are displayed. The full value is included in file “os_full_value.xlsx” of the backup production.
[2] ***Bold, italicized*** cookie names and values denote first-party cookies.
[3] The Google-associated domain that each cookie value is sent is included in file “os_sent_domains.xlsx” of the backup production.
[4] Details on certain cookie values transmitted to Google-associated domains are noted in Appendix F.

Source:
[1] Network transmission data.

Appendix E.3: Comparison of Cookie Values Transmitted to Google Domains
Chrome Version 81 Tested on Windows 10
https://www.cnn.com/

	Chrome				
Cookie Name	**Regular Mode (Initial Session)**	**Regular Mode (Session 1)**	**Private Browsing Mode (Session 1)**	**Private Browsing Mode (Session 2)**	**Regular Mode (Session 2)**
CMID	YkzwId8kVWVIEzUr1enyzQAA	YkzwId8kVWVIEzUr1enyzQAA	YkzyPCucv26xbN-SwMhAQgAA	YkzzZP6xEQUo.K38vGtZ5wAA	YkzwId8kVWVIEzUr1enyzQAA
DSID		NO_DATA			NO_DATA
IDE	AHWqTUlN2XemEwBMOvR1CCdswNIzna	AHWqTUlN2XemEwBMOvR1CCdswNIzna	AHWqTUkZVdzlCb6hbCwEXw1OakmuZA	AHWqTUmIMxouNbkIFu9fZ8AipATpJs	AHWqTUlN2XemEwBMOvR1CCdswNIzna
SCM			23d0b713		
SCMg			23d0b713		
SCMo			23d0b713		
TDID	a64cfaa5-60ad-4856-9d99-4e4d7f				
V	VOKn6p8JHE59				
__gads	***ID=21321b8f5833ebdf-221e78e7f1*** ***ID=21321b8f5833ebdf:T=16492093***	***ID=21321b8f5833ebdf:T=16492093***	***ID=993a7e023854705a:T=16492099***	***ID=602c6fb315a6db66-22d37eccf1*** ***ID=602c6fb315a6db66:T=16492102***	***ID=21321b8f5833ebdf:T=16492093***
kuid		OwuVbYKy			OwuVbYKy
b	624CF042C5558BC40247A47BBLIS				
bdswch			570a5b22-d0e5-4b4d-895b-10bd99		
bsw_uid			570a5b22-d0e5-4b4d-895b-10bd99		
buid			570a5b22-d0e5-4b4d-895b-10bd99		
google_push	AYg5qPIHaQpKSgkKTNtxUhpljGWE5N AYg5qPJzhfx8nUFpxKFJkdzmmo7yxh				
indxexcg	YkzwId8kVWVIEzUr1enyzQAAA8UAAA	YkzwId8kVWVIEzUr1enyzQAAA8UAAA	YkzyPCucv26xbN_SwMhAQgAAAHYAAA	YkzzZP6xEQUo-K38vGtZ5wAAAm4AAA	YkzwId8kVWVIEzUr1enyzQAAA8UAAA
ljt_reader	816a3b232f9d6113ebe199fd		5ad9dfc72e0deb7ba37f88ad		
ptrbsw			570a5b22-d0e5-4b4d-895b-10bd99		
ptrpp	VOKn6p8JHE59				
ptrstk	Hbvo5yhAT-tBWtBWeQd8sxQWv7E				
ptrt	a64cfaa5-60ad-4856-9d99-4e4d7f				
smaato			23d0b713		
suid			0F50A5E59B014584938AC4F51D138D		B2FEF07282D04193B68F5EA7EEFA88
suid_legacy			0F50A5E59B014584938AC4F51D138D		
test_cookie	CheckForPermission		CheckForPermission	CheckForPermission	
ttd	a64cfaa5-60ad-4856-9d99-4e4d7f				
tuuid			570a5b22-d0e5-4b4d-895b-10bd99		
ug	***624cf01e077bc90a3f8d7c0015a21e***	***624cf01e077bc90a3f8d7c0015a21e***	***624cf23904d1350a3f8d7c0017ed89***	***624cf36209593e0a3f8d7c0014c287***	***624cf01e077bc90a3f8d7c0015a21e***
ug1	***624cf01e077bc90a3f8d7c0015a21e***		***624cf23904d1350a3f8d7c0017ed89***	***624cf36209593e0a3f8d7c0014c287***	

Notes:
[1] Only the first 30 characters of a cookie value or URL parameter sent to Google-associated domains are displayed. The full value is included in file "os_full_value.xlsx" of the backup production.
[2] ***Bold, italicized*** cookie names and values denote first-party cookies.
[3] The Google-associated domain that each cookie value is sent is included in file "os_sent_domains.xlsx" of the backup production.
[4] Cookie "ug1" is set by www.ugdturner.com, which appears to be part of Turner Broadcasting System, Inc., the owner of CNN.
[5] Details on certain cookie values transmitted to Google-associated domains are noted in Appendix F.

Source:
[1] Network transmission data.

Appendix E.4: Comparison of Cookie Values Transmitted to Google Domains
Chrome Version 81 Tested on Windows 10
https://www.latimes.com/

	Chrome				
	Regular Mode	**Regular Mode**	**Private Browsing Mode**	**Private Browsing Mode**	**Regular Mode**
Cookie Name	**(Initial Session)**	**(Session 1)**	**(Session 1)**	**(Session 2)**	**(Session 2)**
CMID	Ykz5ikM1Nc2ZA2cml8fixQAA		Ykz6tvu0a-B3CynAXCUx5wAA	Ykz7TnAwoNyV3DD-2mswHgAA	Ykz5ikM1Nc2ZA2cml8fixQAA
IDE	AHWqTUlpgYUwZZXA6uyzLnqeO-suso	AHWqTUlpgYUwZZXA6uyzLnqeO-suso	AHWqTUnfDOp68cgAcZeRmrrjpMioDf	AHWqTUnhU2h2z5EiDE2bjFOqxM0HnD	AHWqTUlpgYUwZZXA6uyzLnqeO-suso
TDID	3e69b9cd-4915-49f7-a0a2-d1f66b		664508e8-946f-4466-b153-986077	2b04b626-e866-49ad-a54b-0b40a9	
__gads	***ID=46e39be51c9cbcbf-22b334acf3***	***ID=46e39be51c9cbcbf:T=16492117***	***ID=32196c0b8623b3ab-2203f19df3***	***ID=8b3a99286e550ce3:T=16492122***	***ID=46e39be51c9cbcbf:T=16492117***
_ga	***1193657418.1649211785***	***1193657418.1649211785***	***519042457.1649212085***	***1299794117.1649212238***	***1193657418.1649211785***
_gid	***19715939.1649211787***	***19715939.1649211787***	***145821108.1649212087***	***1043966232.1649212238***	***19715939.1649211787***
permutive-id		***8964fad0-627b-44c8-b9c2-566b7b***	***96492b17-796f-46bf-9c6f-5c7d5e***	***2ff92a75-dba6-495f-b6bc-0fb8f2***	***8964fad0-627b-44c8-b9c2-566b7b***
test_cookie	CheckForPermission		CheckForPermission	CheckForPermission	
tuuid				9d538feb-1eb8-4eb3-a392-2bd34f	
uuid	***0af0b550-a4d0-42c6-be64-5c6ddc***	***0af0b550-a4d0-42c6-be64-5c6ddc***	***9f668378-c557-44d8-b64d-883f64***	***ae24f9ba-b63d-4551-bf3b-f5ddf5***	***0af0b550-a4d0-42c6-be64-5c6ddc***

Notes:
[1] Only the first 30 characters of a cookie value or URL parameter sent to Google-associated domains are displayed. The full value is included in file “os_full_value.xlsx” of the backup production.
[2] ***Bold, italicized*** cookie names and values denote first-party cookies.
[3] The Google-associated domain that each cookie value is sent is included in file “os_sent_domains.xlsx” of the backup production.
[4] Details on certain cookie values transmitted to Google-associated domains are noted in Appendix F.

Source:
[1] Network transmission data.

CONFIDENTIAL – SUBJECT TO PROTECTIVE ORDER

Appendix E.5: Comparison of Cookie Values Transmitted to Google Domains
Chrome Version 81 Tested on Windows 10
https://www.washingtonpost.com/

	Chrome				
Cookie Name	**Regular Mode (Initial Session)**	**Regular Mode (Session 1)**	**Private Browsing Mode (Session 1)**	**Private Browsing Mode (Session 2)**	**Regular Mode (Session 2)**
CMID	Yk0Bla7znBCyE3jSVUPWcQAA	Yk0Bla7znBCyE3jSVUPWcQAA	Yk0Cdz7tffL-yDRHsn4thgAA	Yk0C-TtbNP6aj1pTpFdNUAAA	
DSID	NO_DATA	NO_DATA	NO_DATA		NO_DATA
IDE	AHWqTUlyBSbXiAIpbQ_hGEOe0kwVO-	AHWqTUlyBSbXiAIpbQ_hGEOe0kwVO-	AHWqTUlwR5X5HtVCF2PqsagUPj85Hj	AHWqTUnc3EtHmv05lZmd-9BGIzWy9y	AHWqTUlyBSbXiAIpbQ_hGEOe0kwVO-
SCM			30c4b39f		faf60ba4
SCMg			30c4b39f		faf60ba4
TDID		cd5ef0c9-f84e-44ae-bb70-a207df			
__gads		***ID=9d636bb76ef88759:T=16492138***			***ID=9d636bb76ef88759:T=16492138***
__uis	445b79fa-0a4a-4782-a07f-f72455				
_ga	***1860824077.1649213842***	***1860824077.1649213842***	***868318960.1649214069***	***703999429.1649214203***	***1860824077.1649213842***
_ga_WRCN68Y2LD	***1649213841***	***1649213967***	***1649214068***	***1649214202***	***1649214332***
_gaexp	***3gY8TfBUQy645wcR55Xl0w.0***	***3gY8TfBUQy645wcR55Xl0w.0***	***3gY8TfBUQy645wcR55Xl0w.1***	***3gY8TfBUQy645wcR55Xl0w.0***	***3gY8TfBUQy645wcR55Xl0w.0***
_gid	***1186922451.1649213842***	***1186922451.1649213842***	***389324518.1649214069***	***1103146517.1649214203***	***1186922451.1649213842***
b		624D01AAF66E89FF1A1C9586BLIS			
google_push					AYg5qPIXzk7OqeIZAmA2RwqmB6nI6D
ljt_reader			74c2aff5965bbf92de6ea74a		
sa-user-id-v2		b1UCIObYTYpSyWThYO2MFRQWv7E		_XsLqnjrQUBFn6nzfYJDgRQWv7E	
suid		CB39D0D58D484997928027247D632A			
test_cookie	CheckForPermission		CheckForPermission	CheckForPermission	
wp_ak_subs	0|20220331		0|20220331		
wp_ak_v_m	***0|20220331***	***0|20220331***	***0|20220331***	***2|20220331***	***0|20220331***
wp_geo	***US|VA|560||***	***US|VA|560||***	***US|VA|560||***	***US|VA|560||***	***US|VA|560||***
wp_usp	***1---***	***1---***	***1---***	***1---***	***1---***

Notes:
[1] Only the first 30 characters of a cookie value or URL parameter sent to Google-associated domains are displayed. The full value is included in file "os_full_value.xlsx" of the backup production.
[2] ***Bold, italicized*** cookie names and values denote first-party cookies.
[3] The Google-associated domain that each cookie value is sent is included in file "os_sent_domains.xlsx" of the backup production.
[4] Details on certain cookie values transmitted to Google-associated domains are noted in Appendix F.

Source:
[1] Network transmission data.

Appendix F

Cookies Transmission Supplementary Analysis

In my testing, I further investigated certain cases of cookie values transmitted to Google-associated domains. A summary of my additional analysis is below.

Cookie Transmission Investigation

Cookie Name	Summary
dc_id	I observed *dc_id* cookie value is attempted to be set by *tag.apxlv.com* and *tag.cogocast.net*, and then sent to *doubleclick.net*. However, the value of this cookie is not stored in memory as confirmed by my test results illustrated in **Figures F.1-F.4**. In this supplementary test, I visit *https://www.cnn.com/* in Safari on macOS in Regular and then Private Browsing Modes to mimic the procedure of the tests in my report. I record transmissions that occur during a Private Browsing Mode session. I observe a *dc_id* cookie value attempted to be set by *apxlv.com* as I observed in my main testing. However, when I check browser memory, I do not find this cookie being stored in memory. This confirms my understanding that *dc_id* cookie is not stored in memory. The cookie values are also different across Regular and Private Browsing Mode sessions which further confirms my conclusions that cookie values are not shared between Regular and Private Browsing Mode sessions
nyt-jkidd	The nyt-jkidd cookie is a first-party cookie with a long value. I observed that a part of the nyt-jkidd cookie was a substring value of "anon" matching a URL parameter sent to *www.google-analytics.com*. Since my exhibits showed only the value that was sent to Google-associated domains, I reviewed the full nyt-jkidd values across Regular and Private Browsing Modes and found that the values associated with the Private Browsing Mode session were different. This confirms my conclusions that cookie values are not shared between Regular and Private Browsing Mode sessions.

NID OTZ	I observed the values of third-party cookies OTZ and NID transmitted in Private Browsing Mode to Google-associated domains in Firefox on Windows. I understand that Firefox Private Browsing Mode blocks cross-site cookie tracking but not all third-party cookies.[1] Values of OTZ and NID cookies that I observe in these instances are not the same across Regular and Private Browsing Mode sessions. This supports my opinion that cookie values are not shared between Regular and Private Browsing Mode sessions.
TDID	I found that cookie values are transmitted in Private Browsing Mode in some instances where Private Browsing Mode has third-party cookie blocking enabled in default settings (e.g., Chrome on Windows). This transmission is triggered because of a request to *https://match.adsrvr.org/* which attempts to set the value of *TDID* cookie on the browser but is blocked. The browser then transmits the value of the cookie via a redirection to *doubleclick.net* without setting the third-party cookie on the browser. I observed the "redirectURL" in the "response" header containing the value associated with the *TDID* cookie which was the same value as was transmitted to *cm.g.doubleclick.net:* *https://match.adsrvr.org/track/cmb/google?g_uuid=&gdpr=0&gdpr_consent=&ttd_tdid=cc96810a-201c-48c3-a8c4-dfdbeb20b04d&google_error=3* Even though the value is transmitted to doubleclick.net and is attempted to be set by *https://match.adsrvr.org/*, it was not set to browser memory. To confirm my understanding, I visited *https://www.nytimes.com/* in Chrome on macOS first in Regular Mode. I then closed the Regular Mode session, opened an Incognito session and visited *https://www.nytimes.com/* again. I observed that

[1] Firefox private browsing mode blocks third party cookies starting from version 89, released in June 2021 (*See e.g.*, Edelstein, Arthur, "Firefox 89 blocks cross-site cookie tracking by default in private browsing," *Mozilla Security Blog*, *Mozilla Corporation*, June 1, 2021, available at https://blog.mozilla.org/security/2021/06/01/total-cookie-protection-in-private-browsing/).

	TDID was similarly attempted to be set by *https://match.adsrvr.org/* but it did not exist in browser memory. The results of my test are presented in **Figures F.5-F.8**. Since the *TDID* cookie value is different from other sessions, this underscores that cookie values are not shared between Regular Mode and Private Browsing Mode sessions.
V	I observed the value of a third-party cookie named *V* transmitted to *cm.g.doubleclick.net* as a URL parameter when visiting *https://www.cnn.com/* in Private Browsing Mode (Session 2) on Windows. The third-party cookie value is contained in an HTTP Response header but not set on the browser. When the browser accesses *https://www.cnn.com/*, there are a series of redirected HTTP requests to different hosts including *cm.g.doubleclick.net*. Therefore, this value is transmitted but not being stored to browser memory. To confirm my understanding, I visited *https://www.cnn.com/* in Regular Mode. Then I close a Regular Mode session, opened an Incognito Mode session and visited *https://www.cnn.com/*. As confirmed by **Figures F.9-F.11**, *V* cookie value is attempted to be set but not stored in memory of the browser. Since the *V* cookie values are different between Regular Mode Sessions and Private Browsing Session, this supports my opinion that cookie values are not shared between Regular Mode and Private Browsing Mode sessions.
wp_ak_subs wp_ak_v_m wp_geo wp_usp	I observed the same cookie values in Regular and Private Browsing Modes. I understand that the values of these cookies are determined by certain static settings or parameters (e.g., date when I accessed the website or the area my IP address was associated with). To illustrate and verify that these values were not shared across sessions, I investigated this further by using Developer Tools and visiting *https://www.washingtonpost.com/*. First, I accessed the site with a clean browser memory in Regular Mode and looked at the cookies stored in the session. I observed these cookies in the browser memory. I then closed the browser and opened an Incognito Mode session and checked whether there were any cookies

	in memory on the browser. I did not observe any cookies stored in the Incognito Mode session which confirms my understanding that even though the values are the same across sessions, these values are not leaked between Regular and Private Browsing Modes. I illustrate my findings in **Figures F.12** and **F.13** below.

Figure F.1

dc_id HTTP Header

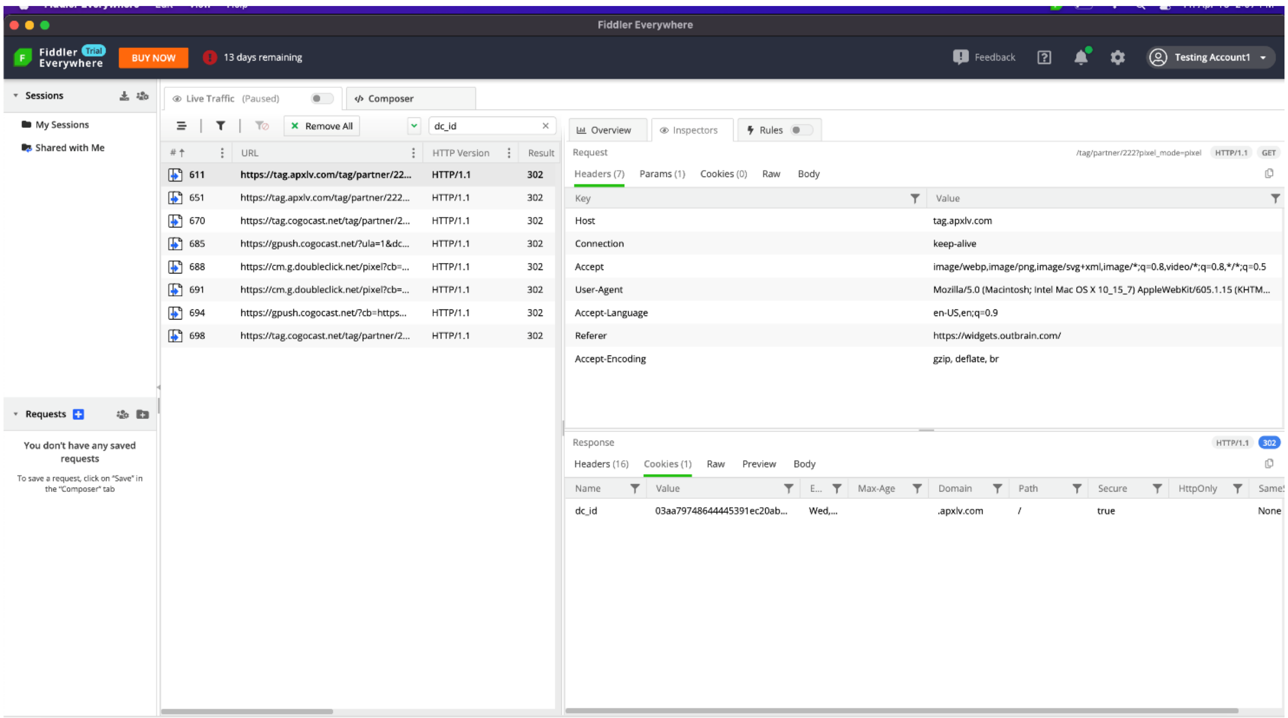
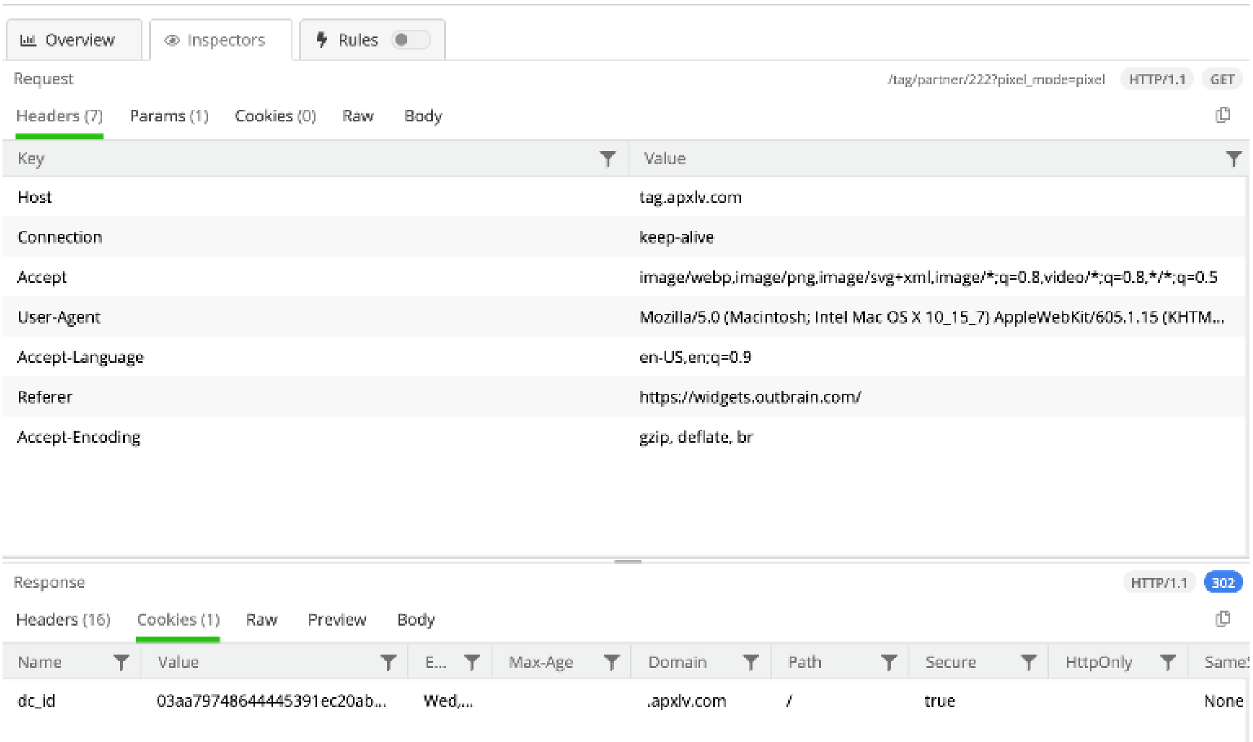


Figure F.2

dc_id HTTP Header (Enlarged)


Overview | Inspectors | Rules

Request /tag/partner/222?pixel_mode=pixel HTTP/1.1 GET

Headers (7) Params (1) Cookies (0) Raw Body

Key	Value
Host	tag.apxlv.com
Connection	keep-alive
Accept	image/webp,image/png,image/svg+xml,image/*;q=0.8,video/*;q=0.8,*/*;q=0.5
User-Agent	Mozilla/5.0 (Macintosh; Intel Mac OS X 10_15_7) AppleWebKit/605.1.15 (KHTM...
Accept-Language	en-US,en;q=0.9
Referer	https://widgets.outbrain.com/
Accept-Encoding	gzip, deflate, br

Response HTTP/1.1 302

Headers (16) Cookies (1) Raw Preview Body

Name	Value	E...	Max-Age	Domain	Path	Secure	HttpOnly	SameS
dc_id	03aa79748644445391ec20ab...	Wed,...		.apxlv.com	/	true		None

Figure F.3

dc_id Cookie not Stored in Memory

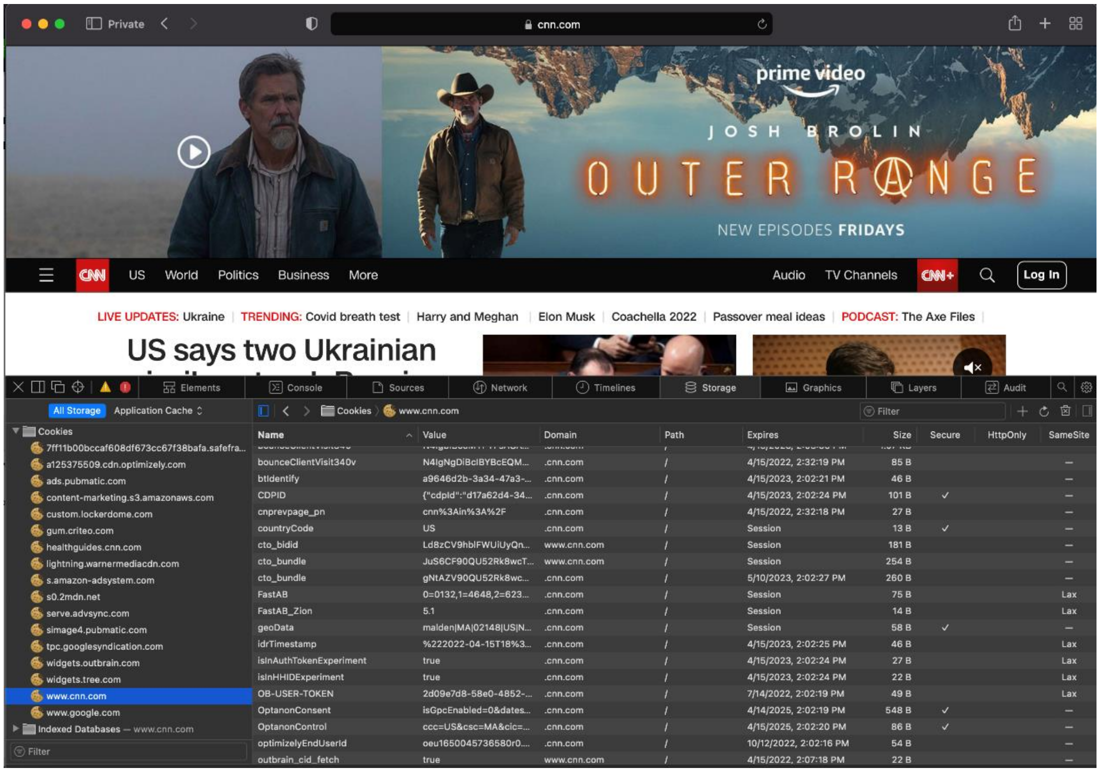
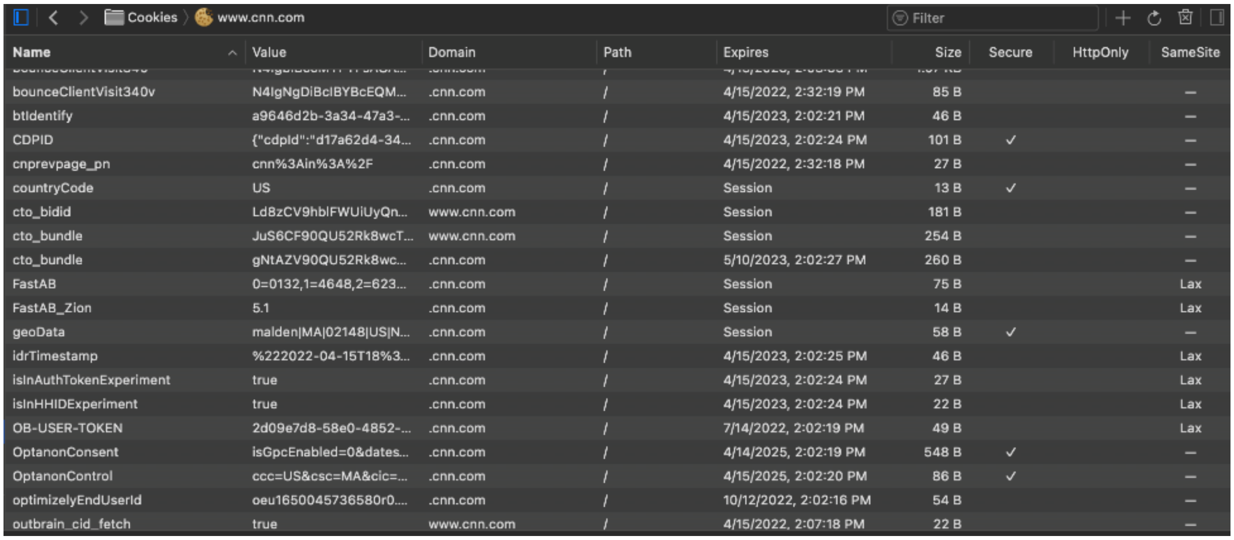


Figure F.4

dc_id Cookie not Stored in Memory (Enlarged)



Name	Value	Domain	Path	Expires	Size	Secure	HttpOnly	SameSite
bounceClientVisit340v	N4IgNgDiBcIBYBcEQM...	.cnn.com	/	4/15/2022, 2:32:19 PM	85 B			—
btIdentify	a9646d2b-3a34-47a3-...	.cnn.com	/	4/15/2023, 2:02:21 PM	46 B			—
CDPID	{"cdpId":"d17a62d4-34...	.cnn.com	/	4/15/2023, 2:02:24 PM	101 B	✓		—
cnprevpage_pn	cnn%3Ain%3A%2F	.cnn.com	/	4/15/2022, 2:32:18 PM	27 B			—
countryCode	US	.cnn.com	/	Session	13 B	✓		—
cto_bidid	Ld8zCV9hbIFWUiUyQn...	www.cnn.com	/	Session	181 B			—
cto_bundle	JuS6CF90QU52Rk8wcT...	www.cnn.com	/	Session	254 B			—
cto_bundle	gNtAZV90QU52Rk8wc...	.cnn.com	/	5/10/2023, 2:02:27 PM	260 B			—
FastAB	0=0132,1=4648,2=623...	.cnn.com	/	Session	75 B			Lax
FastAB_Zion	5.1	.cnn.com	/	Session	14 B			Lax
geoData	malden|MA|02148|US|N...	.cnn.com	/	Session	58 B	✓		—
idrTimestamp	%222022-04-15T18%3...	.cnn.com	/	4/15/2023, 2:02:25 PM	46 B			Lax
isInAuthTokenExperiment	true	.cnn.com	/	4/15/2023, 2:02:24 PM	27 B			Lax
isInHHIDExperiment	true	.cnn.com	/	4/15/2023, 2:02:24 PM	22 B			Lax
OB-USER-TOKEN	2d09e7d8-58e0-4852-...	.cnn.com	/	7/14/2022, 2:02:19 PM	49 B			Lax
OptanonConsent	isGpcEnabled=0&dates...	.cnn.com	/	4/14/2025, 2:02:19 PM	548 B	✓		—
OptanonControl	ccc=US&csc=MA&cic=...	.cnn.com	/	4/15/2025, 2:02:20 PM	86 B	✓		—
optimizelyEndUserId	oeu1650045736580r0....	.cnn.com	/	10/12/2022, 2:02:16 PM	54 B			—
outbrain_cid_fetch	true	www.cnn.com	/	4/15/2022, 2:07:18 PM	22 B			—

Figure F.5

TDID HTTP Response Header

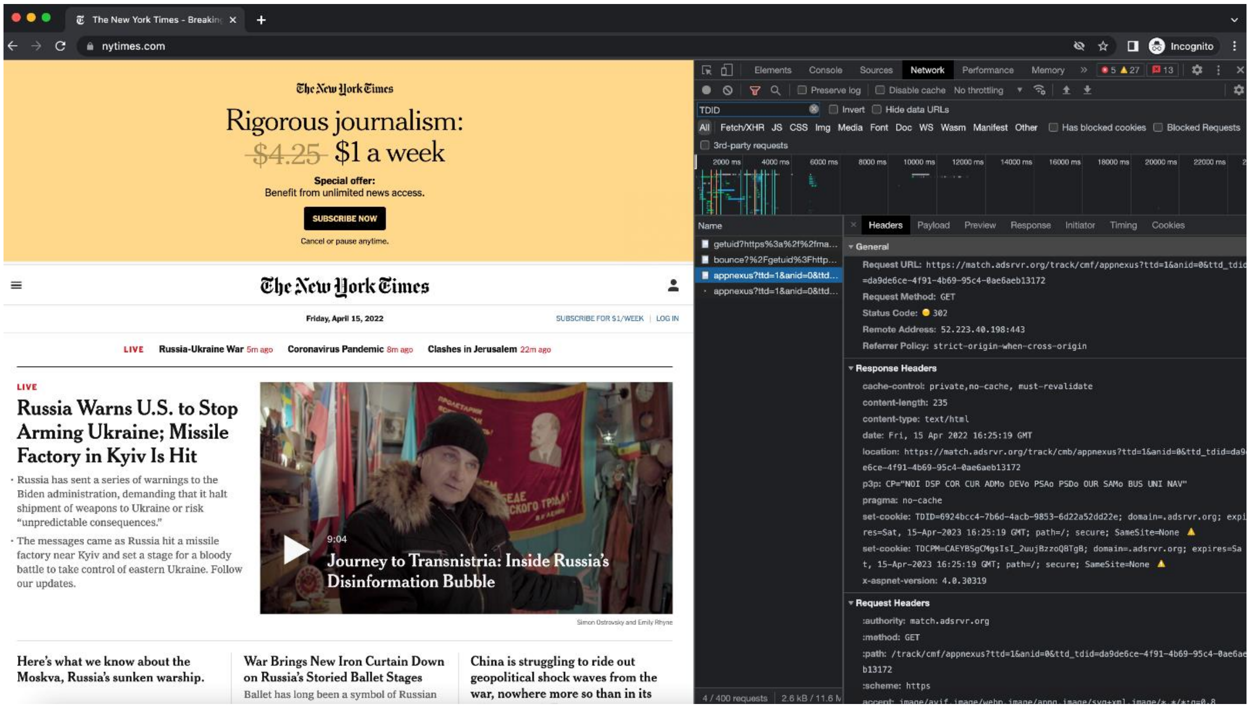


Figure F.6

TDID Cookie HTTP Response Header (Enlarged)

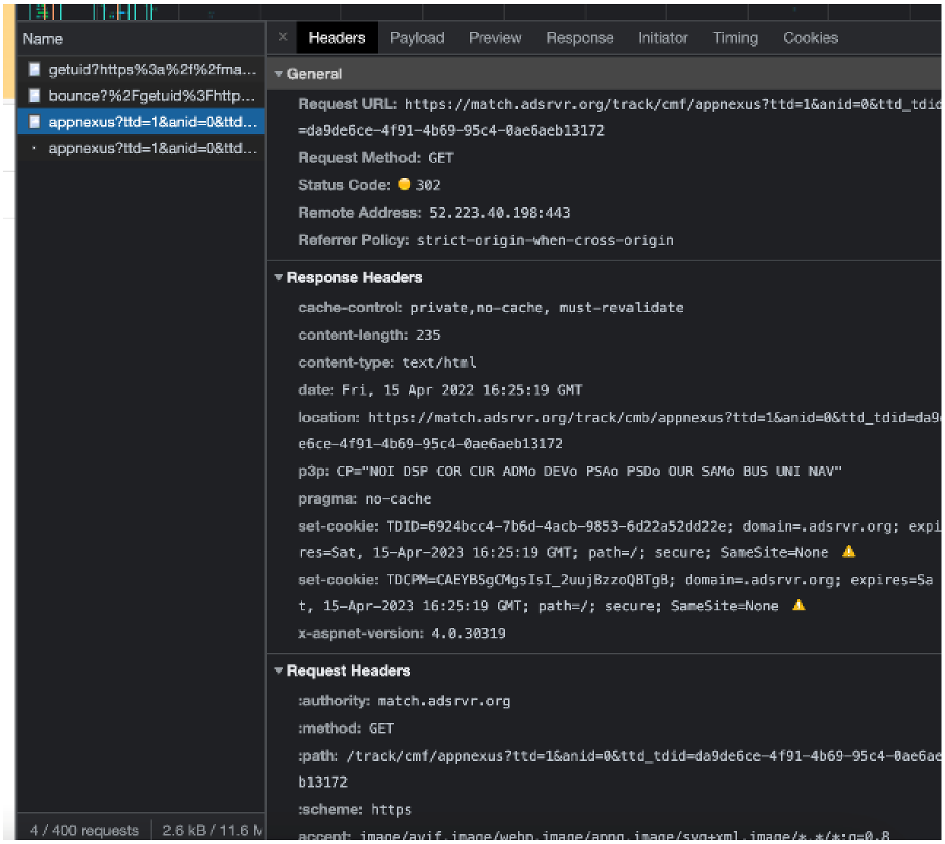


Figure F.7

TDID Cookie not Stored in Memory

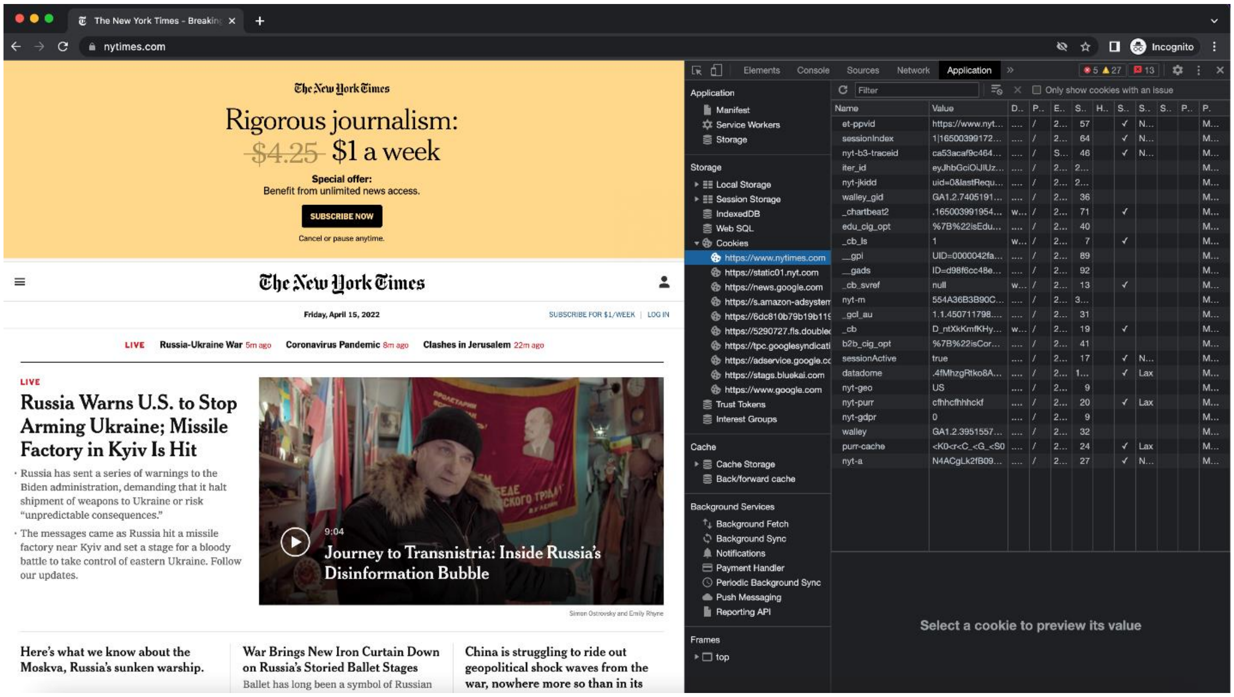


Figure F.8

TDID Cookie not Stored in Memory (Enlarged)

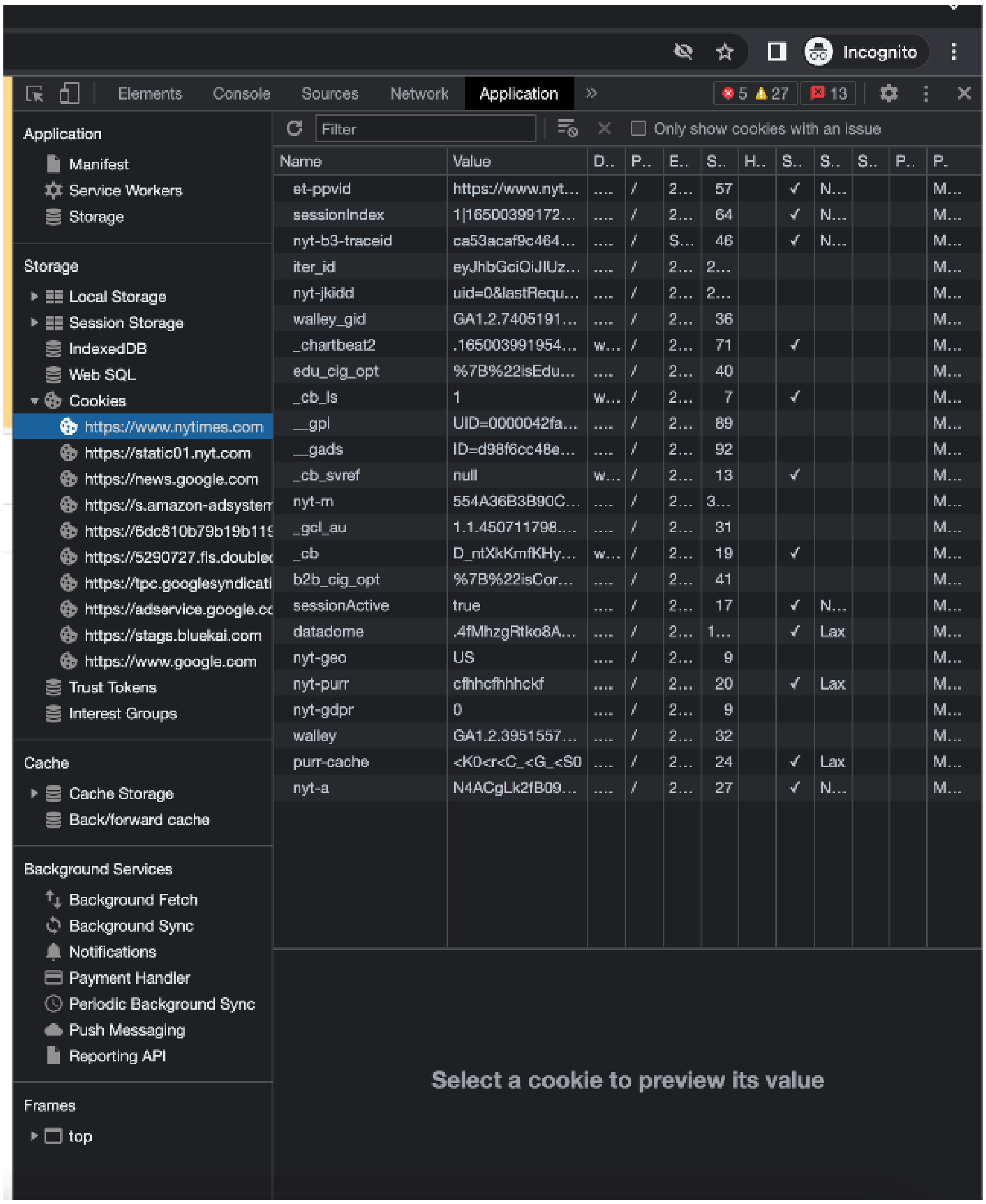


Figure F.9

V Cookie HTTP Response Header

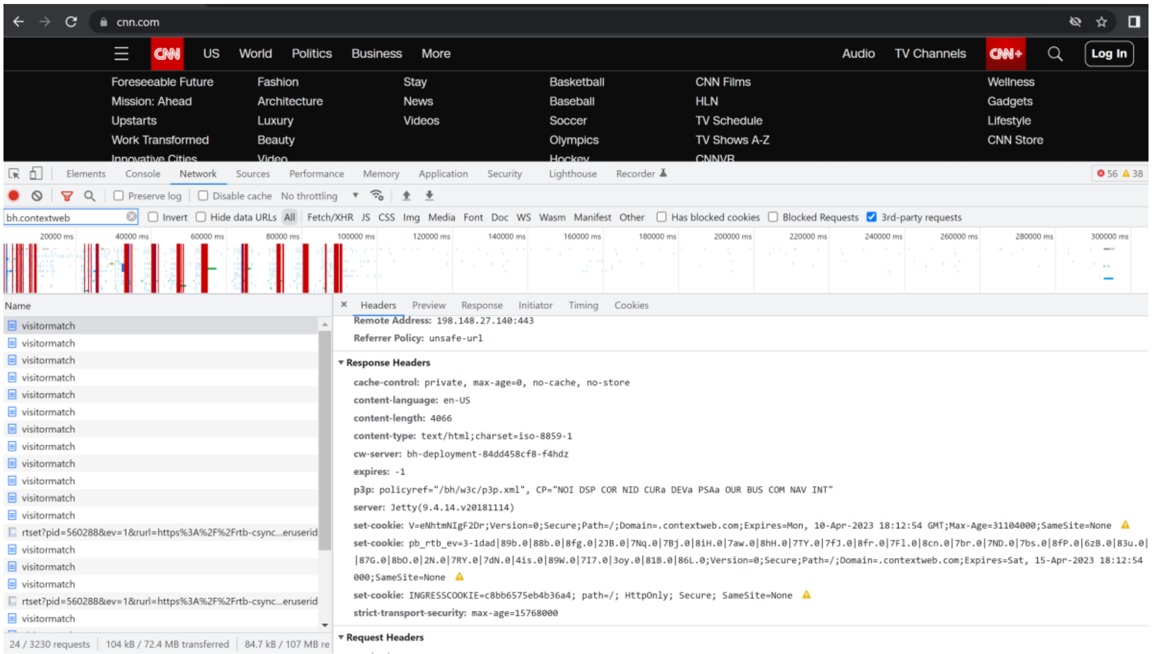


Figure F.10

V Cookie HTTP Response Header (Enlarged)

Figure F.11

V Cookie not Stored in Memory

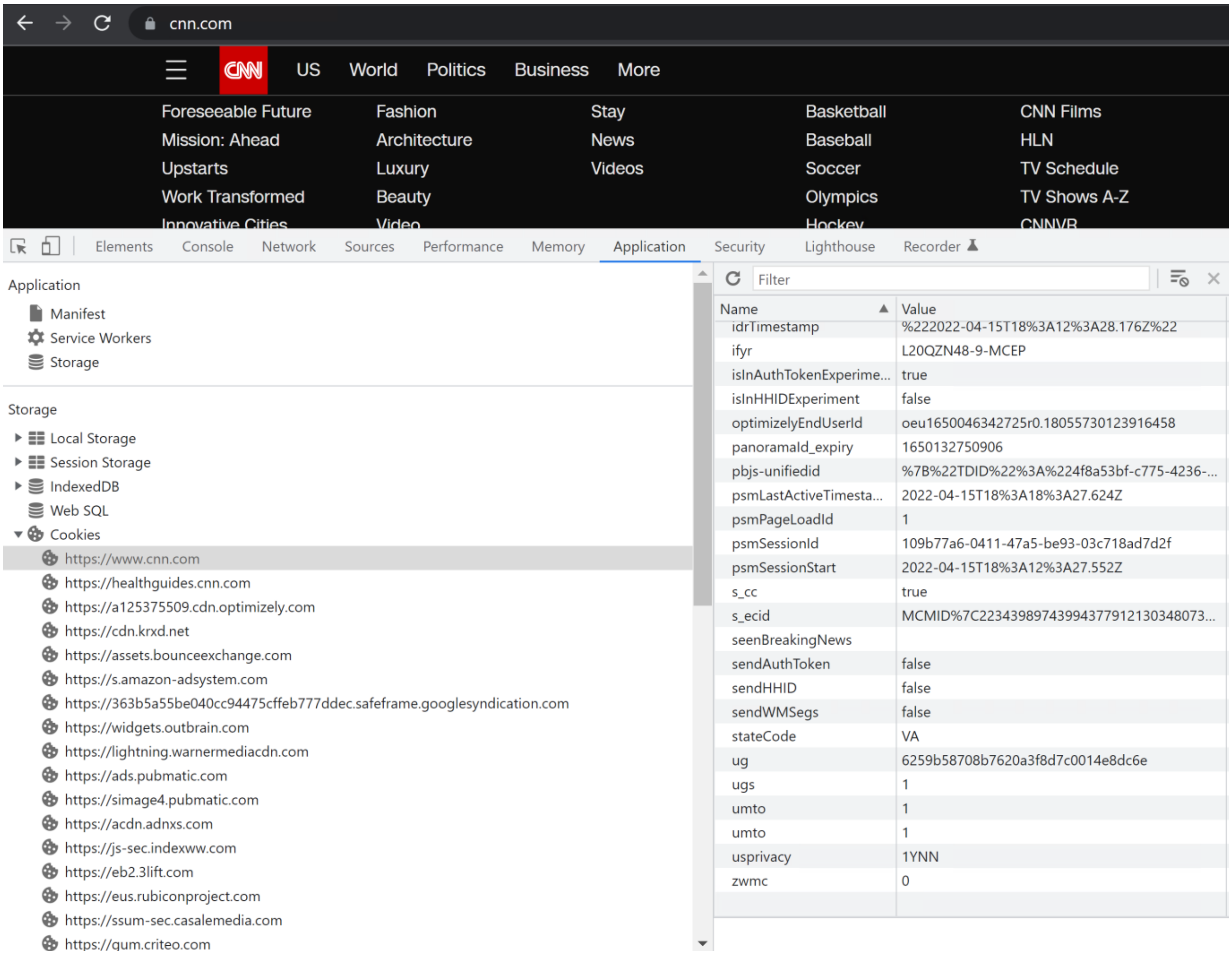


Figure F.12

Cookies Stored after Visiting *https://www.washingtonpost.com/* in Regular Mode

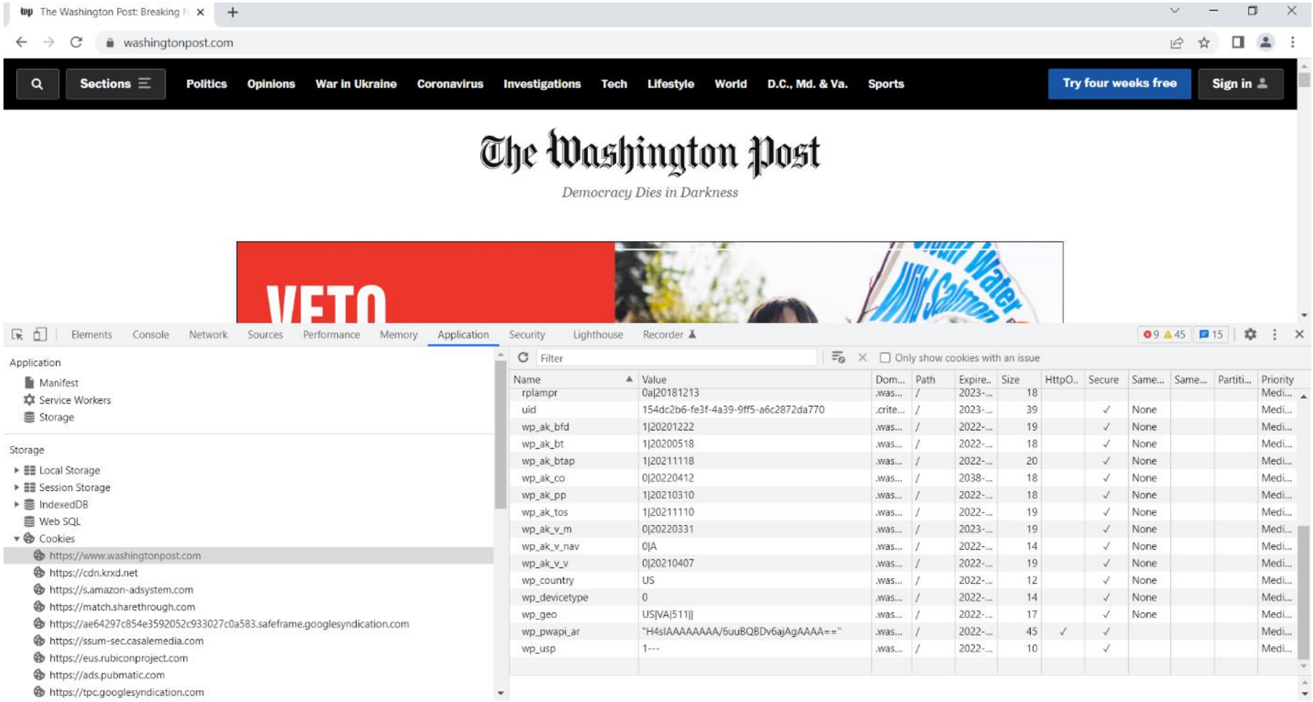


Figure F.13

No Cookies Stored after Visiting *https://www.washingtonpost.com/* in Private Browsing Mode

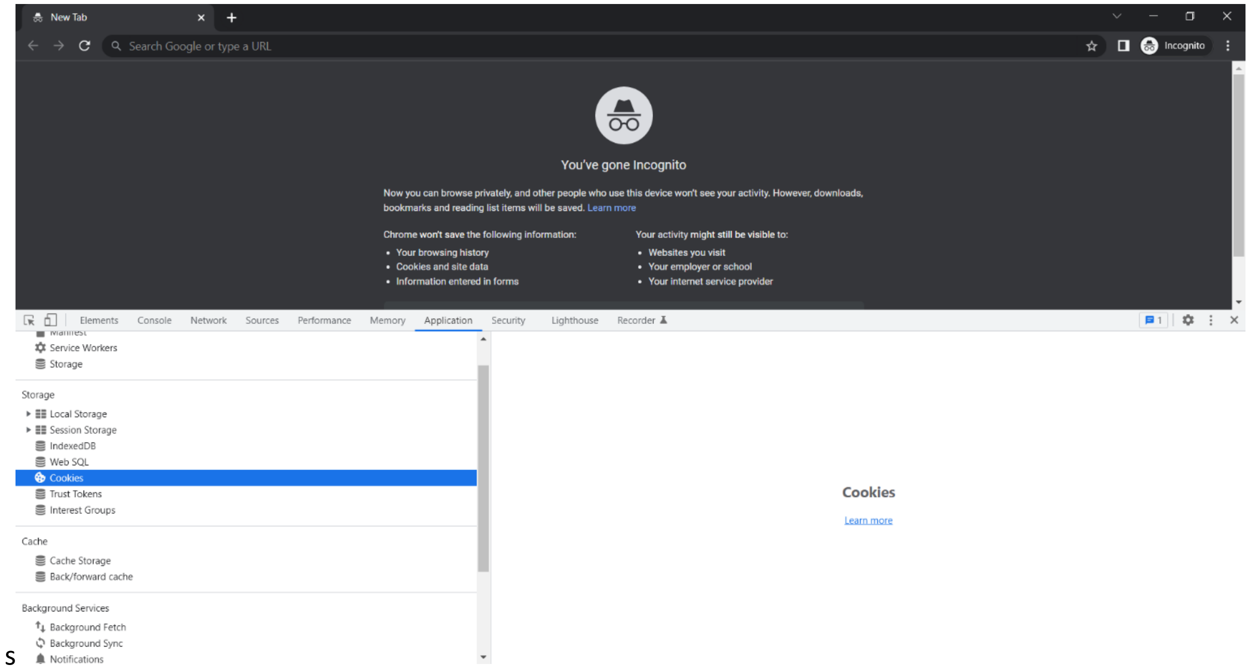


EXHIBIT 2

Redacted Version of Document Sought to be Sealed

UNITED STATES DISTRICT COURT

NORTHERN DISTRICT OF CALIFORNIA, OAKLAND DIVISION

CHASOM BROWN, WILLIAM BYATT, JEREMY DAVIS, CHRISTOPHER CASTILLO, and MONIQUE TRUJILLO, individually and on behalf of all other similarly situated, Plaintiff, v. GOOGLE LLC, Defendants.	Case No. 5:20-cv-03664-YGR

EXPERT REBUTTAL REPORT OF GEORGIOS ZERVAS, PHD

JUNE 7, 2022

TABLE OF CONTENTS

I. EXECUTIVE SUMMARY

1. I have been engaged in this matter by counsel for Google LLC ("Google") to respond to certain opinions in the Expert Report of Jonathan E. Hochman.[1] Specifically, I address Mr. Hochman's Opinions 1 through 6, 10, 15, and 26 through 29 pertaining to Mr. Hochman's description of how Google's analytics and advertising services function and whether Private Browsing Mode functions as described in public documents.[2] I understand that experts Konstantinos Psounis and Paul Schwartz are submitting expert reports in which they will address other opinions in Mr. Hochman's report. Based on my experience, the materials I reviewed in this matter, and my testing of Chrome and other browsers in my opening report, I have reached the following opinions.

Zervas Rebuttal Opinion 1 (See Section III.A)

2. In my opinion, Mr. Hochman's assertion in his Opinion 1 that "Google intentionally intercepted private browsing communications between users and non-Google websites while those communications were in transit"[3] and his descriptions of Google's receipt of information as "interception" or "surveillance"[4] are misleading. Mr. Hochman fails to

[1] Expert Report of Jonathan E. Hochman, April 15, 2022 ("Hochman Report").

[2] Throughout this report and consistent with my opening report, I use the term "Private Browsing Mode" to refer generally to private browsing modes of various browsers, and I use the term "Private Browsing Session" to refer to browsing sessions where the browser is in Private Browsing Mode. I use the term "Incognito Mode" or simply "Incognito" to refer to the Private Browsing Mode of the Chrome browser in particular. I use the term "Regular Mode" to refer to browsing modes other than Private Browsing Mode. Regular Mode can encompass multiple modes of browser operation depending, for example, on a user's sign-in state.

[3] Hochman Report, Section VIII.A.

[4] See e.g., Hochman Report, ¶¶ 78-79, 82-84; Hochman Report, Appendix A, ¶ 17.

acknowledge that Google receives transmissions of At-Issue Data[5] because website developers have decided to use one or more of Google's services by incorporating code into their website to cause those transmissions. Mr. Hochman also fails to acknowledge that it is well known and understood in the web development industry that when a website developer uses one or more third-party services and installs the relevant code on their website to enable that functionality, it will result in transmission of certain data to those third-party services.

3. Mr. Hochman also fails to acknowledge that how Private Browsing Modes operate is widely understood in the industry. For example, the World Wide Web Consortium ("W3C") states that browser vendors should design private browsing modes so that they work in a way that is "indistinguishable" for websites from normal browsing mode.[6] Mr. Hochman has not identified, and I have not seen, any evidence indicating that website developers expect that the third-party services they have chosen to use on their website, such as Google's analytics and advertising services, will cease to function when a user visits their website in a Private Browsing Mode.

4. It is my opinion that those who are familiar with how modern websites operate and how browsers communicate with those websites, even at a general level, would not use terms like "interception" or "surveillance" to describe Google's receipt of information related to a user's visit in Private Browsing Mode to a website that uses Google's analytics or advertising services.[7] To

[5] In my opening report, I summarized the categories of information that Plaintiffs allege Google collects and enable Google to identify users, their devices, and activity as "At-Issue Data." See, Expert Report of Dr. Georgios Zervas, April 15, 2022 ("Zervas Affirmative Report"), ¶ 14. Mr. Hochman does not use the term At-Issue Data but instead refers to information sent to Google as "communications" and "transmissions." For purposes of this report, I use the terms "communication" and "transmissions" to be consistent with the terminology used by Mr. Hochman.

[6] "W3C TAG Observations on Private Browsing Modes," W3C, July 5, 2019, available at https://perma.cc/5CHW-LNER.

[7] See, e.g., Hochman Report, ¶¶ 78-79, 82-84; Hochman Report, Appendix A, ¶ 17.

the contrary, Google provides its analytics and advertising services to website developers who take the active step of installing the relevant code on their websites. If the website developers do not install and enable Google's analytics and advertising code, Google would not receive these communications. As a result, I do not agree with Mr. Hochman's opinion that these transmissions are "interceptions" or "surveillance" by Google.

Zervas Rebuttal Opinion 2 (See Section III.B)

5. Mr. Hochman's assertions related to his Opinion 2 that "a major function of the tracking beacons is to collect highly personal information about users' browsing activities […] such as the contents of their communications with non-Google websites in the form of detailed URL requests, webpage and video interactions, and more,"[8] are unsupported. Mr. Hochman did not perform any analysis of how the At-Issue Data qualifies as "contents" of users' communications with non-Google websites. Based on the definition of the term "contents" that counsel has provided me and which I have described in **Section III.B** below, I do not agree that the At-Issue Data in this case constitutes "contents" of users' communication with non-Google websites. For example, IP address and user agent string are fields that are either required or typically included in messages that conform to the HTTP protocol. As a result, these items are more analogous to ancillary characteristics of the message that are generated in the course of communications, rather than the intended message itself. Mr. Hochman also refers to "URL requests," "webpage and video interactions," and "the URL of the specific webpage visited by the user," none of which meet the definition of "contents" that counsel has provided to me, with the exception of if the URL requests also contained information such as search terms or form

[8] Hochman Report, ¶ 3.

information entered by the user (and Mr. Hochman has not identified any instances where he has found that to be the case).[9]

Zervas Rebuttal Opinion 3 (See Section III.C)

6. Mr. Hochman's assertions throughout his report that Google "copied" information is incorrect.[10] For example, Mr. Hochman argues that "Google's tracking beacons embedded in the web page cause information to be copied from that communication and sent to Google's servers concurrently with the user's private communication with the non-Google website."[11] My understanding of the technical definition of "copy" is the process of reading certain information from one source and writing or reproducing exactly the same information in another place. Mr. Hochman has not performed an analysis to establish that Google copied information from the communications between the user and the non-Google website.

7. Mr. Hochman incorrectly assumes that when separate communications contain the same information that means the information was "copied" from one communication to another, as opposed to being separately read from the same source. For example, Mr. Hochman refers to IP addresses as data that are copied from the user's communication with non-Google websites. But he ignores that the IP address is assigned to the user's device and will be the same for different communications from that device, not because the IP address value is copied from one communication to another. As a result, I do not agree with Mr. Hochman's characterization of transmissions to Google as containing information that was "copied" from a user's communications with non-Google websites.

---

9 Hochman Report, ¶¶ 3, 96.

10 See, e.g., Hochman Report, ¶¶ 45, 96, 110.

11 Hochman Report, ¶ 96.

Zervas Rebuttal Opinion 4 (See Section III.D)

8. Mr. Hochman asserts in his Opinion 3 that "the Google tracking beacons which cause private browsing communications to be intercepted neither facilitate nor are incidental to the communications between users and non-Google websites."[12] In making this assertion, Mr. Hochman fails to acknowledge that the "tracking beacons" to which he refers are integral parts of the design and operation of non-Google websites. Mr. Hochman also ignores how websites use and benefit from the Google services that use these "tracking beacons."

9. If a website developer chooses to include Google's (or other) services by incorporating the relevant tags into their website, those tags and the resulting services become a part of the website as it has been designed by the website developer.[13] Because the tags are an integral part of the website, in my opinion, the communications triggered by those tags are incidental to the communications between the user and the website. In making the claim that these communications are not incidental, Mr. Hochman implicitly assumes that a portion of the website (e.g., comprising the third-party tags) is somehow unnecessary to the website as it has been designed by the developer. I disagree with such an assumption. When a user visits a website that uses these services, she is interacting with the webpage as an entire product consisting of first- and third-party services and code as it is designed by the website developer, not as independent pieces of code that can be arbitrarily ignored.

---

[12] Hochman Report, ¶ 4.

[13] As I define in my opening report, tag is a short snippet of JavaScript code included into the HTML code of the website. These tags run as part of the website to transmit data to corresponding third-party services such as Google's analytics and advertising services. See, Zervas Affirmative Report, ¶ 88; "HTML <script> Tag," *W3Schools*, available at https://perma.cc/KH7P-MY7D.

10. When a user visits the website that includes a Google tag, her browser transmits information to Google when that tag is executed. These transmissions facilitate the communications between the user and the website because the tag itself is an integral part of the website as designed by the website developer. The transmissions also facilitate communications between the user and website because they enable the website to display the Google features (e.g., Google Ads) that the website's developer has requested to be displayed, or enable the website developer to examine how users interact with their website (e.g., via Google Analytics) so that they can improve users' experiences, for example. Therefore, in my opinion, these transmissions facilitate use of the website as the developer has designed it.

Zervas Rebuttal Opinion 5 (See Section III.E)

11. Mr. Hochman asserts in his Opinion 4 that "Google could have at any point before or during the class period, redesigned Chrome Incognito to either stop or limit Google's collection of private browsing information from the private communications between users and non-Google websites."[14] Mr. Hochman's opinion is misleading and speculative, and often relies on misrepresentations of the sources he cites.

12. Mr. Hochman makes a number of speculative proposals on how Google could have redesigned its products without analyzing the feasibility of those proposals. To support his assertions, Mr. Hochman relies on selected statements of current and former Google employees that are taken out of context and therefore are misleading. I discuss examples of such statements in **Section III.E** of this report.

[14] Hochman Report, ¶ 5.

13. Mr. Hochman also presents misleading counterexamples of other browsers like Firefox and Safari, which he contends show how certain features could have functioned in Chrome. However, he ignores that these browsers generally operate in a manner similar to Chrome, and also ignores that the alternative functionality he proposes is not uniformly adopted by the different browsers that he identifies.

Zervas Rebuttal Opinion 6 (See Section IV.A)

14. Mr. Hochman's assertions related to his Opinion 5 that users are not notified about data collections when in Private Browsing Mode[15] and that Google could have provided such notifications[16] are flawed. Mr. Hochman ignores the fact that users are notified of how Private Browsing Modes function when they open a Private Browsing Session. Mr. Hochman also ignores that, consistent with Google's policies, many websites do provide notices to users about the websites' collection of data, including collection of data via Google's analytics and advertising services. I also disagree with Mr. Hochman's assertion that users were not provided a choice regarding the collection of At-Issue Data, because he ignores the variety of tools that are available to users that affect the transmissions of At-Issue Data, including tools that work even if a user is in Private Browsing Mode. For these reasons, I find Mr. Hochman's opinions regarding user notifications and user controls over the transmission of the At-Issue Data to be flawed.

---

[15] Hochman Report, ¶ 134.

[16] Hochman Report, ¶ 6.

Zervas Rebuttal Opinion 7 (See Section IV.B)

15. Mr. Hochman's Opinion 6, that Google "intercepted private browsing communications without notifying websites or providing a choice at the time of collection"[17] is flawed. Many website developers are aware of how the technology they embed to their websites functions, and even discuss the importance of testing websites in Private Browsing Mode for various purposes. Furthermore, Mr. Hochman's assertion that Google could provide a notification to websites at the time that Private Browsing Mode transmissions occur is based on an incorrect assumption that Google's tags or the websites that use those tags are able to discern whether or not a user is in Private Browsing Mode. In contrast, as I discuss in **Section IV.B**, and in accord with industry recommendations, browsers are designed not to inform websites whether the user is in Private Browsing Mode. Thus, Mr. Hochman's assertion that Google could have provided notifications to websites at the time of the Private Browsing Mode transmissions is inconsistent with industry recommendations for Private Browsing Modes.

Zervas Rebuttal Opinion 8 (See Section V)

16. Mr. Hochman's Opinion 10 that "Google, throughout the class period, created detailed profiles tied to various Google identifiers (that remain undisclosed to users) based on the private browsing information it collected"[18] is inconsistent with the way Private Browsing Modes operate. Mr. Hochman ignores that analytics and advertising cookie values in Private Browsing Sessions are "orphaned" islands of data that are different from those sent in Regular Mode sessions and other Private Browsing Sessions. In my opening report, I demonstrated through systematic

[17] Hochman Report, ¶ 7.

[18] Hochman Report, ¶ 11.

testing that cookie values stored from prior Regular Mode Sessions are not used in Private Browsing Sessions and that cookie values set in a Private Browsing Session are not carried over to subsequent Regular or Private Browsing Sessions. Thus, the Private Browsing Session cookie values cannot be used to link records of user activities across different sessions or to create the "profiles" Mr. Hochman describes.

Zervas Rebuttal Opinion 9 (See Section VI)

17. Mr. Hochman's Opinion 15 alleges that Google attempted "to circumvent efforts by other companies to block Google tracking beacons." Mr. Hochman's arguments are overly broad and based on flawed descriptions of how certain technologies work.

18. First, Mr. Hochman asserts that "[w]ith the loss of certain Google cookies (e.g., due to blocking of certain Google cookies based on Apple's Intelligent Tracking Prevention ('ITP') or Google's [redacted] changes to Chrome Incognito Mode), Google mitigates targeting loss by relying on first-party identifiers, such as the PPID available for Google Ad Manager 360 Publishers."[19] Mr. Hochman also asserts that "[t]his identifier is used to identify users that log into publisher websites, and it uniquely identifies a user across all of the user's devices, browsers, and browsing sessions, including private browsing sessions."[20]

19. I disagree with Mr. Hochman's broad statements on PPID. PPID only applies when a user visits a publisher's website which uses the PPID functionality, and the user signs in to or otherwise identifies herself to the website to allow the publisher to set the PPID. PPIDs are not the same from one publisher's website to the next and thus cannot be used for tracking across sites.

[19] Hochman Report, ¶ 187.

[20] Hochman Report, ¶ 187.

PPID values are also hashed or encrypted, rendering them meaningless to Google. And Google blocks the use of PPID for users that have opted out of personalized ads. Mr. Hochman's assertion that the use of PPID allows Google to circumvent third-party cookie blockers is incorrect for numerous reasons, including that PPID cannot be used in the same manner as third-party cookies because it is not used to track users across websites and apps operated by different publishers.[21] Therefore, contrary to what Mr. Hochman asserts, in my opinion, the PPID feature does not circumvent third-party cookie blockers or the tracking blocking features of the Firefox and Apple technologies Mr. Hochman identified.

20. Second, Mr. Hochman makes similar misleading statements about the feature called Enhanced Conversion. Mr. Hochman asserts that "through Enhanced Conversions in Analytics and Ads, non-Google websites send personally identifying information such as a user's email address (user's name, home address, and phone number may also be used) to Google to be matched against the same user's Google account information containing the same identifying information."[22] I disagree with Mr. Hochman's statements regarding enhanced conversions, which require that a user is signed into their Google account at the time that they engage with an ad and that the user then provides some information such as an email or a phone number to the advertiser that the advertiser could send back to Google in hashed form to measure a conversion. I do not agree that the enhanced conversion feature is a replacement for third-party cookies or that its use circumvents third-party cookie blockers or the tracking blocking features of the Firefox and Apple technologies to which Mr. Hochman refers.

---

[21] "About publisher provided identifiers," *Ad Manager Help, Google*, available at https://perma.cc/P6WG-YX4S.

[22] Hochman Report, ¶ 209.

Zervas Rebuttal Opinion 10 (See Section VII)

21. Mr. Hochman asserts in his Opinions 26 through 28 that Google "uniformly attempted to intercept all private browsing communications with non-Google websites that have a Google tracking beacon,"[23] that there is a "near certainty that almost every person"[24] that used a Private Browsing Mode had their information intercepted by Google, and that Google "does not offer users any control to escape"[25] its tracking beacons. I disagree with each of these assertions.

22. As described herein and in my opening report,[26] Google makes available to websites multiple settings that affect whether and how Google's tags function on their website. Because those settings cause the tags' operation to vary, I do not agree with Mr. Hochman's assertion that Google "uniformly attempted to intercept all private browsing communications."[27]

23. Contrary to Mr. Hochman's assertion that users do not have any means to "escape" Google's code on non-Google websites, Google and other entities have made available to users a variety of browser settings and extensions that affect whether At-Issue Data are transmitted to Google. In my opening report, I discussed and conducted tests to confirm this. Because those user settings affect the data transmissions to Google, I disagree with Mr. Hochman's assertion that users do not have any means to "escape" Google's code on non-Google websites, and I also disagree that users are uniformly impacted by that code.

24. Mr. Hochman also states that "[t]he Plaintiffs in this case are alleging that Google portrayed private browsing mode, including Incognito Mode, as the control to prevent Google

23 Hochman Report, ¶ 27.

24 Hochman Report, ¶ 28.

25 Hochman Report, ¶ 29.

26 Zervas Affirmative Report, Section V.

27 Hochman Report, ¶ 27.

from tracking them across non-Google websites."[28] I disagree with this assertion. As described in my opening report and herein, when a user enters a Private Browsing Mode in a browser, they are presented with information on how the Private Browsing Mode works and what information will still be visible to websites. As confirmed by my testing, Private Browsing Modes operate in a manner that is consistent with those descriptions. Furthermore, Private Browsing Modes like Incognito Mode do provide a measure of control and privacy for the user because any cookie values set during a Private Browsing Session are discarded at the end of the session, which is consistent with how Private Browsing Modes are described to users.

Zervas Rebuttal Opinion 11 (See Section VIII)

25. Mr. Hochman asserts in his Opinion 29 that Chrome Incognito Mode does not function the way Google states. To the contrary, in my opening report, I tested and confirmed that Incognito Mode operates as Google described to users in Incognito's Splash Screen and "Learn More" pages, which inform users about what Incognito Mode does and does *not* do; my tests also confirmed that Private Browsing Modes in other browsers similarly operate as described to users. In particular, my tests show that Private Browsing Sessions start with a clean cookie jar, and cookie values set during such sessions are not reused in the subsequent Regular or Private Browsing Sessions. I was also able to confirm that the user's browsing history, website logins, and autofill web forms are not carried over to the subsequent browsing sessions.

Zervas Rebuttal Opinion 12 (See Section IX.A)

26. I disagree with Mr. Hochman's assertion in Section VIII.B of his report that "typical consumers" would not be able to understand and use browser Developer Tools.

[28] Hochman Report, ¶ 312.

Mr. Hochman does not clarify the type of consumer he has in mind or what challenges he imagines prevent them from using Developer Tools. While many users may not be inclined to use Developer Tools, some will. Developer Tools can be accessed by any user and can easily be opened, and there is an abundance of online sources that explain how to use Developer Tools. Holding a technical degree or having a deep technical background is thus not necessary to use these tools.

Zervas Rebuttal Opinion 13 (See Section IX.B)

27. I disagree with Mr. Hochman's assertion in Section VIII.A of his report regarding alleged negative impacts of Google's services on users' energy and device costs. In making this assertion, Mr. Hochman relies on a single article that does not even mention Google's analytics and advertising services. This assertion is also conceptually flawed, as it relies on the unreasonable assumption that if Google services disappear, no other third-party analytics and advertising services would exist and cause the same alleged impact on users' energy and device costs.

Zervas Rebuttal Opinion 14 (See Section IX.C)

28. Mr. Hochman asserts in Section VIII.A of his report that users do not have the option to request deletion of their Private Browsing Mode data. In my opinion, this assertion is misleading and relies on the assumption that Private Browsing Mode data are associated with a specific user, or that Google can identify Private Browsing Mode users to facilitate deletion of that data, which is inconsistent with sources upon which Mr. Hochman relies.

II. INTRODUCTION

A. Qualifications

29. I am an Associate Professor of Marketing at Boston University Questrom School of Business, a founding member of the Faculty of Computing & Data Sciences, and Affiliated Faculty of the Department of Computer Science. I am also a visiting researcher at Microsoft Research New England. Prior to joining the Boston University faculty, I held academic roles including visiting scholar at the MIT Sloan School of Management, Simons Postdoctoral Fellow at Yale University, and affiliate at the Center for Research on Computation and Society at Harvard University's John A. Paulson School of Engineering and Applied Sciences. I am an associate editor of ACM Transactions on Economics and Computation, and I sit on the editorial review boards of Marketing Science, the Journal of Marketing Research, and the Journal of Marketing.

30. My research, which falls in the broader area of digitization, combines methods from computer science and economics to study online marketplaces to understand their impact on consumer and firm behavior. I have conducted studies on online marketplaces such as Airbnb, Yelp, TripAdvisor, and Expedia. My work is empirical in nature and relies on assembling and analyzing novel sources of data that I collect from these marketplaces to study their operation. I hold a Bachelor of Engineering and a Master of Science in Computer Science from Imperial College in London, a Master of Arts in Interactive Media from London College of Communication, and a Ph.D. in Computer Science from Boston University. Before pursuing my Ph.D. in computer science, I ran a small information technology (IT) company. My C.V. is attached as **Appendix A**, and a list of my prior testimony is attached as **Appendix B**.

31. I am being compensated at the rate of $700 per hour for my time on this case. Research and analysis for this report was also performed by Analysis Group personnel under my

direction and guidance. My compensation is not contingent upon my findings, the testimony I may give, or the outcome of this litigation.

32. On April 15, 2022, I submitted an opening report and offered opinions on the relevant technology at issue: Private Browsing Modes in Chrome and other browsers and Google's advertising or analytics services[29] offered to third-party websites.

B. Assignment

33. I have been engaged in this matter by counsel for Google LLC ("Google") to respond to certain opinions in the Expert Report of Jonathan E. Hochman ("Hochman Report").

34. Mr. Hochman was retained by counsel for the Plaintiffs "to develop and render opinions concerning the technology and practices at issue in this litigation with respect to several products."[30] The products included in Mr. Hochman's report include "those utilizing Google tracking code (e.g., Google Analytics and conversion tracking code) and Google advertising code (e.g., Google Ad Manager and Google AdSense advertising code)."[31]

35. In this report, I have been asked to review and respond to certain opinions presented in Mr. Hochman's report regarding Google' analytics and advertising services and Private Browsing Modes. My opinions are described in this report.

36. My failure to address any specific sentence or opinion in Mr. Hochman's report does not mean that I agree with it, and no such agreement should be inferred.

---

[29] Throughout this report, I refer to specific Google services by their names (e.g., Google Analytics, Google Ad Manager, Google Analytics 360). I refer to Google's analytics services and Google's advertising services as a collection of respective tools.

[30] Hochman Report, ¶ 54.

[31] Hochman Report, ¶ 54.

C. Facts And Data Considered

37. In forming my opinions, I have relied upon my professional and academic experience and reviewed documents obtained from public sources. I also relied on the data and analysis based on the experiments I conducted in my opening report. I have also reviewed and relied upon the deposition testimony of Google witnesses and documents produced by Google in this case.

38. The sources I considered in forming my opinions are identified in this report and the accompanying exhibits and are listed in the attached **Appendix C**.

39. Should additional relevant documents or information be made available to me, I reserve the right to supplement my opinions as appropriate.

III. REBUTTAL TO MR. HOCHMAN'S DESCRIPTIONS OF GOOGLE'S ANALYTICS AND ADVERTISING SERVICES

A. Mr. Hochman's Assertions That Google "Intentionally Intercepts" Private Browsing Communications Are Inaccurate (Hochman Opinion 1)

40. In his Opinion 1, Mr. Hochman contends that "Google, by way of various tracking beacons, intercepted private browsing communications between users and non-Google websites while those communications were in transit."[32] Mr. Hochman similarly offers an opinion that "Google, throughout the class period, intentionally intercepted private browsing communications between users and non-Google websites while those communications were in transit and collected private browsing information from those communications."[33] As support for these statements, Mr. Hochman describes the functionality of what he calls Google's "tracking code" or "tracking

[32] Hochman Report, ¶ 2.

[33] Hochman Report, ¶ 78.

and advertising code."[34] In my opinion, Mr. Hochman's descriptions of that code and how it functions are both inaccurate and misleading.

41. As an initial matter, throughout his report, Mr. Hochman uses phrases like "tracking and advertising products," "tracking and advertising code," and "tracking beacons" to describe multiple different products, including Classic Google Analytics, Google Analytics 360, Google Analytics 4, Universal Analytics, Google Ad Manager, and Google AdSense.[35] However, as described in my opening report, these are distinct products.[36] Mr. Hochman uses these phrases in his report to make broad statements, and at times incorrectly implies that his description of the features or functionality of one product is common to the entire group of products. For example, Mr. Hochman asserts that "Google tracking beacons throughout the class period had a common functionality in terms of Google's interception and data collection, not limited to the Analytics and Ad Manager codes."[37] Because Analytics and Ad Manager are distinct products with different features, I disagree with Mr. Hochman to the extent he asserts that they have a "common functionality."

42. In his report, Mr. Hochman repeatedly characterizes communications sent to Google as "interceptions." For example, Mr. Hochman asserts:

---

[34] Hochman Report, ¶¶ 79-80.

[35] Hochman Report, ¶¶ 79-80, fn. 6, 8.

[36] See e.g., Zervas Affirmative Report, Section V.

[37] Hochman Report, ¶ 84.

- "Google Interception: Throughout the class period, Google intentionally intercepted private browsing communications between users and non-Google websites while those communications were in transit."[38]
- "It is my opinion that Google, throughout the class period, intentionally intercepted private browsing communications between users and non-Google websites while those communications were in transit and collected private browsing information from those communications."[39]
- "Google Analytics tracking beacons intercept private communication between the user and the non-Google website's server and send the intercepted communication to Google."[40]
- "Google intercepts private browsing information through tracking beacons designed by Google to intercept and collect information from communications between users and non-Google websites, including while users are in a private browsing mode."[41]
- "The fundamental operation of the Google tracking beacon for the purpose of intercepting private browsing information at issue in the case is independent of the device and browser."[42]

[38] Hochman Report, Section VIII.A. Description.

[39] Hochman Report, ¶ 78.

[40] Hochman Report, Appendix A, ¶ 17.

[41] Hochman Report, ¶ 83.

[42] Hochman Report, Appendix B, ¶ 13.

43. Mr. Hochman also uses the phrase "surveillance of the user" in describing the Google Analytics product.[43] In my opinion, persons who are familiar with how modern websites operate and how browsers communicate with those websites, even at a general level, would not use terms like "interception" or "surveillance" to describe Google's receipt of information related to a user's visit to a website that uses Google's analytics or advertising services; nor would such a characterization be consistent with the mechanics of how these communications take place. Thus, Mr. Hochman's use of terms such as "intercepted," "intentionally intercepted," and "surveillance" to describe Google's analytics and advertising services is incorrect and misleading.

44. Mr. Hochman ignores that these communications to Google only happen because websites have chosen to utilize one or more of Google's analytics or advertising services. Google offers these services to website developers, but the developers make the decision themselves to use the services and incorporate the associated Google tags or any other code. For example, as I described in Sections V.A and V.B of my opening report, to use Google Analytics and Google Ad Manager services, website developers must incorporate "tags, which are short snippets of JavaScript code, into the HTML source code for their website."[44] If the website developers do not incorporate the Google tags necessary to enable the Google service, the communications to Google that Mr. Hochman describes would not occur.

45. To illustrate this point, I visited *https://www.wikipedia.org/*, a website that does not incorporate Google tags, using the Chrome browser in Incognito Mode and recorded the browser's communications using Chrome Developer Tools. As shown in **Figure 1** below, I observed eight

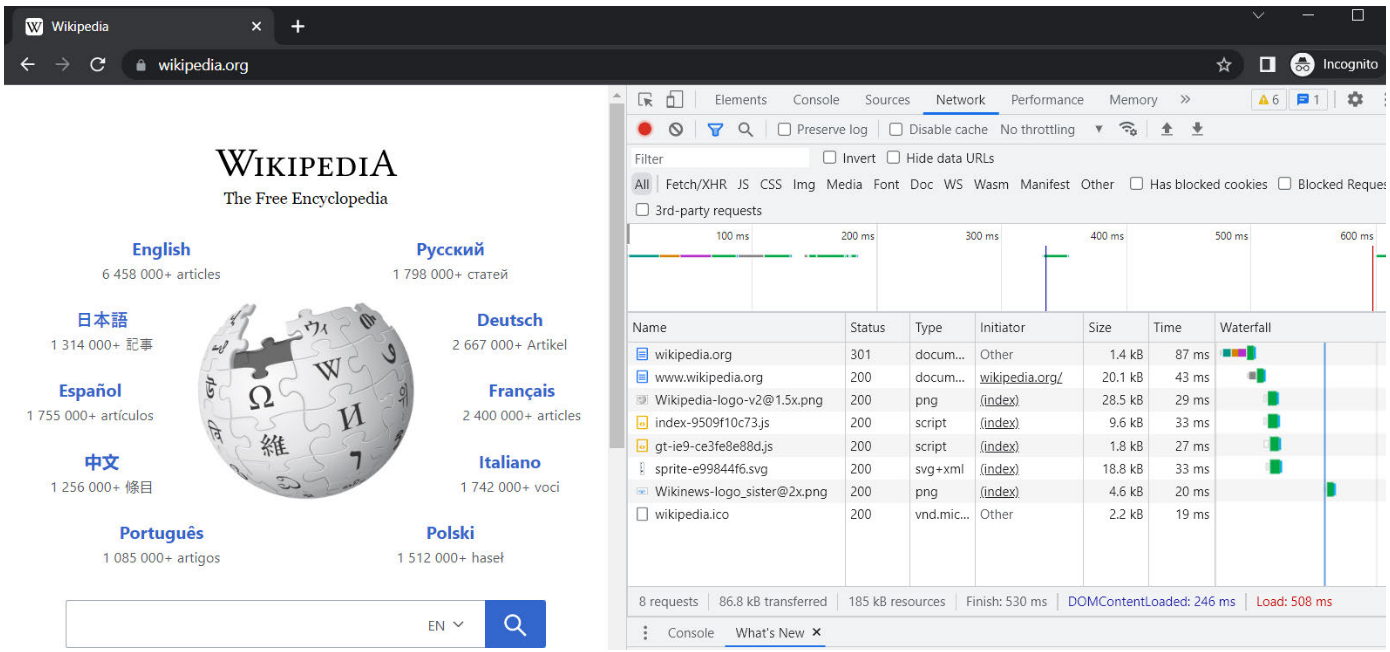
---

43 Hochman Report, Appendix A, ¶ 17.

44 Zervas Affirmative Report, ¶ 88.

separate HTTP requests, none of which were to the domains associated with Google.[45] This is consistent with my expectations, because *wikipedia.org* does not incorporate the tags that would trigger transmissions to Google. In characterizing Google's receipt of information as an "interception," Mr. Hochman ignores the fact that those transmissions are a result of the website developer's installation of the relevant Google tags on their website.

Figure 1
Wikipedia.org Home Page Without Communications to Google



46. Mr. Hochman also ignores that the relevant Google tags can be configured by website developers who choose to use Google's analytics or advertising services, and there are settings available to those developers that would affect the transmission of At-Issue Data to Google via those tags. In Sections V.A.1 and V.B.1 of my opening report, I described several ways website developers and publishers can affect transmissions of At-Issue Data to Google. For example,

45 I describe HTTP requests in Section III.B of my opening report.

Google Analytics provides website developers a way to disable Google Analytics functionality on a webpage to honor visitors' opt-out choices, without removing the Google Analytics tag itself.[46,47] When this feature is enabled, it will prevent the Google Analytics tag from storing cookie values and sending them to Google Analytics."[48,49] Google Analytics also provides an Analytics User ID feature, but these User IDs are generated, assigned, and managed by the first-party website.[50] If a website developer does not enable or configure this feature, User ID data will not be sent to Google Analytics. Similarly, Google Ad Manager provides a setting "to serve 'limited ads,'" which are ads that "disable all personalization and features that require use of a local identifier."[51,52]

47. As discussed in my opening report, modern websites typically use multiple third-party services similar to those Google provides.[53] Google offers website developers a significant amount of information regarding how the tags that enable its services work, and it is my expectation that developers use the tags with full knowledge that they are designed to automatically send information to Google when users visit their websites (subject to various settings available to the website developer and to browser users).

---

[46] "Disable Google Analytics measurement," *Google Analytics, Google*, available at https://perma.cc/FXP9-3CGT.

[47] "Manage user privacy," *Google Analytics, Google*, available at https://perma.cc/PVW7-EBB2.

[48] "Disable Google Analytics measurement," *Google Analytics, Google*, available at https://perma.cc/FXP9-3CGT.

[49] "Manage user privacy," *Google Analytics, Google*, available at https://perma.cc/PVW7-EBB2.

[50] "User-ID limits," *Analytics Help, Google,* available at https://perma.cc/V6BT-9A8X.

[51] Zervas Affirmative Report, ¶ 95; "Disable Google Analytics measurement," *Google Analytics, Google*, available at https://perma.cc/FXP9-3CGT; "Manage user privacy," *Google Analytics*, *Google*, available at https://perma.cc/PVW7-EBB2; Zervas Affirmative Report, ¶ 110; "Limited Ads," *Google Ad Manager Help*, *Google*, available at https://perma.cc/MT25-D2C3.

[52] I discuss other options available to websites and users in more detail in **Sections VII** and **IX** of this report.

[53] Zervas Affirmative Report, ¶ 39.

48. I am also aware that some website developers perform testing of their websites in Private Browsing Mode, for example to test how the website will work when users visit the site in a Private Browsing Mode.[54] It is also well known in the industry that Private Browsing Modes are designed not to inform websites of users' private browsing status. For example, the W3C states that "when the differences in browser behavior between privacy and standard browsing modes can be detected because of standardization or implementation details, websites might choose to degrade browsing experience (for example, not displaying content) when they detect the users in private browsing modes. This is undesirable."[55] The W3C further states, "browser vendors should work towards achieving private browsing mode work in a way indistinguishable for […] sites from the normal mode, to respect the user's […] privacy […]."[56]

49. Based on the public information identified above, I expect that website developers are aware of how the tags for Google's advertising and analytics operate and how Private Browsing Modes work, including the fact that browsers do not identify whether a user is in Regular or Private Browsing Mode. Mr. Hochman has not identified, and I have not seen, any evidence indicating that website developers are not aware that third-party services such as Google's analytics and advertising services operate in Private Browsing Modes similarly to how they operate in Regular Browsing Modes. It is thus incorrect to claim that Google "intercepted," "intentionally intercepted," and conducted "surveillance" through its analytics and advertising services.

---

[54] "Strategies for carrying out testing," *MDN Web Docs*, available at https://perma.cc/F5G6-KN2C.

[55] "W3C TAG Observations on Private Browsing Modes," *W3C*, July 5, 2019, available at https://perma.cc/5CHW-LNER.

[56] "W3C TAG Observations on Private Browsing Modes," *W3C*, July 5, 2019, available at https://perma.cc/5CHW-LNER.

B. Mr. Hochman Does Not Provide Any Support For His Opinion That "Tracking Beacons" Collect The Content Of Users' Communications (Hochman Opinion 2)

50. In his Opinion 2, Mr. Hochman states that "a major function of the 'tracking beacons' is to collect highly personal information about users' browsing activities […] such as the contents of their communications with non-Google websites in the form of detailed URL requests, webpage and video interactions, and more."[57]

51. I understand Google disputes that the At-Issue Data[58] constitute "contents" under applicable laws. While I do not offer an opinion on the meaning of the term "contents" in this context, I understand from counsel that for purposes of Plaintiffs' claims in this case, "contents" refers to the intended message conveyed by the communication and does not include information generated in the course of the communication that is used to facilitate delivery of the message. I have also been asked by counsel to assume that (1) URLs of pages visited alone are not "content"; and (2) to qualify as "content," URLs must contain the user's search terms, not just the webpage the user was viewing. For example, while an HTTP request could theoretically include search terms or messages from a user, these are not required fields and whether a particular HTTP request in fact contains "contents" requires analysis of the information contained in the message.

52. Mr. Hochman did not analyze what specific information constitutes "contents of [users'] communications with non-Google websites."[59] Instead, he generally refers to "detailed URL requests, webpage and video interactions, and more," and subsequently asserts that information Google collected includes "the URL of the specific webpage visited by the user

---

[57] Hochman Report, ¶ 3.

[58] Zervas Affirmative Report, ¶ 14.

[59] Hochman Report, ¶ 3.

(including the full URL viewed by the user on the non-Google website, which would include folders, subfolders, and precise file requested from the webserver), the user's IP address, and the user agent string of the user's browser, among other information."[60] Based on the definition described above, I do not agree that this information constitutes "contents" of a user's communication with the non-Google website. The IP address and user agent string are fields that are either required or typically included in messages that conform to the HTTP protocol, and thus are information used to facilitate delivery of the message that are generated in the course of communications, not the intended message itself. As a result, these items are more analogous to ancillary characteristics of the message that are generated in the course of communications, rather than the intended message itself. Mr. Hochman also refers to "URL requests," "webpage and video interactions," and "the URL of the specific webpage visited by the user," each of which is similar to URLs of pages visited, which is not "contents" under the definition of that term counsel has provided to me, with the exception of if the URL requests also contained information such as search terms or form information entered by the user (and Mr. Hochman has not identified any instances where he has found that to be the case).

C. Mr. Hochman Fails To Establish That Google "Copied" Information From Users' Communications

53. In multiple assertions throughout his report, Mr. Hochman uses the term "cop[y]" to describe Google's services in a way that is misleading and unsupported.[61] For example, Mr. Hochman makes the following assertions:

---

[60] Hochman Report, ¶¶ 3, 96.

[61] Hochman Report, ¶ 96.

- "Google tracking beacons use the Chrome browser to copy and send users' browsing history to Google servers."[62]
- "Google's tracking beacons embedded in the web page cause information to be copied from that communication and sent to Google's servers concurrently with the user's private communication with the non-Google website."[63]
- "Google tracking beacons are loaded and used by Google to intercept communications between users and non-Google websites to obtain information that is contemporaneously copied from the initial GET message and sent to Google servers."[64]

54. Mr. Hochman does not provide a definition of what he means by "copy" in this context. For example, one definition of "copying" in computer science is a process that "creates an exact image of a file on a disk with different file name."[65] In other words, the term "copy" is the process of reading certain information from one source and writing or reproducing exactly the same information in another place. Mr. Hochman has not shown any evidence that the information he asserts as "copied" originated from users' communication with non-Google websites.

55. For example, Mr. Hochman asserts that the information "copied" from users' communications with non-Google websites includes "user's IP address, and the user agent string of the user's browser among other information."[66] Mr. Hochman has not identified any evidence supporting his assertion that IP address and user agent strings are "copied" from these

---

62 Hochman Report, ¶ 45.

63 Hochman Report, ¶ 96.

64 Hochman Report, ¶ 110.

65 "cp command in Linux with examples," *GeeksforGeeks*, February 19, 2021, available at https://perma.cc/2TV6-H3DY.

66 Hochman Report, ¶ 96.

communications. As I discuss in my opening report, an IP address is an essential component of internet communications because it informs a client and a server where the information should be sent.[67] Similarly, the "User-Agent" field is present in most HTTP requests and is used to inform the server about the user's device and web browser. This information can be used to display content to a user.[68] As long as a user's IP address does not change (as happens, for example, if the user connects to another network), and as long as a user agent does not change (as happens, for example, if a user decides to browse with another device or browser), these types of information will be identical across different requests, even if users visit different websites. But the fact that the IP address and user agent are the same does not mean they are "copied" from the communications with the website's servers, as Mr. Hochman asserts. To the contrary, this is information transmitted in HTTP requests as a basic aspect of Internet communications. Mr. Hochman incorrectly assumes that when separate communications contain the same information that means the information was "copied" from one communication to another, as opposed to being separately read from the same source.

56. Because of the above, and because Mr. Hochman has not identified any evidence that information sent to Google is "copied" from the communications between a user and third-party website rather than as part of regular internet communications, I disagree with his assessment of how Google's analytics and advertising services operate.

---

[67] See e.g., Zervas Affirmative Report, ¶ 24.

[68] "Definition of User Agent," *W3C,* June 16, 2011, available at https://perma.cc/5FCX-K45N; "HTTP headers | User-Agent," *GeeksforGeeks*, October 11, 2019, available at https://perma.cc/QAA8-S428.

D. Mr. Hochman's Assertion That Google "Tracking Beacons" "Neither Facilitate Nor Are Incidental To" Users' Communications With Websites Is Incorrect (Hochman Opinion 3)

57. In his Opinion 3, Mr. Hochman asserts that "the Google tracking beacons which cause private browsing communications to be intercepted neither facilitate nor are incidental to the communications between users and non-Google websites."[69] In offering this opinion, Mr. Hochman ignores how websites use and benefit from Google's services. This statement is also incorrect because it fails to take into account how web browsing technologies generally operate and why third-party services exist.

58. Modern websites are a combination of first- and third-party code. While websites appear as unified pages to the user, they typically draw on many different files from various sources. As I explained in my opening report, third-party services allow for efficient software development by leveraging code reusability, which allows separate entities to develop and maintain a smaller part of code.[70] As I further discussed in my opening report, certain functionalities enabled by JavaScript code are complex and inefficient, if not impossible, for most websites to develop or replicate on their own.[71] As a result, many smaller-scale businesses would find it prohibitive to develop and maintain features that are provided by third-parties, such as Google. Availability of such services enables businesses to compete for online presence and improve business performance.[72]

---

[69] Hochman Report, ¶ 4.

[70] Zervas Affirmative Report, ¶ 39.

[71] Zervas Affirmative Report, ¶ 39.

[72] "Three Ways APIs Are Keeping Small Businesses Digitally Competitive," *Small Business Trends,* February 10, 2022, available at https://perma.cc/6W7V-ZR5N; Berman, Ron, and Ayelet Israeli, "The Value of Descriptive Analytics: Evidence from Online Retailers," *Harvard Business School*, Working Paper 21-067, 2021, available at https://perma.cc/B7JY-V3UX; Benzell, Seth G., Guillermo Lagarda,

59. Mr. Hochman provides a misleading and one-sided opinion discussing only the alleged negative impacts of Google's analytics and advertising services, while ignoring the fact that those services are necessary for websites. For example, advertising is an important source of revenue without which many websites would not exist and/or would not be able to provide free content to users without charging subscription fees.[73]

1. *Google's Analytics And Advertising Services And Related Tags Facilitate And Are Incidental To Users' Communications With Websites*

60. I disagree with Mr. Hochman's assertion that Google's analytics and advertising services "neither facilitate nor are incidental to the communications between users and non-Google websites."[74] In my opinion, Google's analytics and advertising services do facilitate and are incidental to communications between users and websites that use Google services because the websites have chosen to make Google services *part of the website*.

61. It is common for modern websites to include third-party services that are required to enable certain functionality such as styling, payment methods, maps, analytics, videos, or advertising. Websites often use multiple Google and non-Google third-party services. For example, I visited Plaintiffs' attorneys' website *https://www.forthepeople.com/* in Incognito Mode and recorded all transmissions on the home page using Chrome Developer Tools. Just visiting the home page triggered transmissions to 61 third-party domains, only a portion of which were

and Marshall Van Alstyne, "The Impact of APIs on Firm Performance," *Boston University Questrom School of Business Research Paper*, available at https://perma.cc/5FRY-WTSF.

73 "Ad-Supported vs Subscription: Which is Better," *Aniview*, December 11, 2021, available at https://perma.cc/7NN2-XFEY.

74 Hochman Report, ¶ 4.

associated with Google. **Figure 2** illustrates the top ten third-party domains that I observed in terms of the number of transmissions associated with each respective domain:[75]

Figure 2
Transmissions To Third-Party Domains When Loading *https://www.forthepeople.com/*

Domain	Number of Transmissions
wistia.com	116
litix.io	29
simpli.fi	23
tiktok.com	14
doubleclick.net	12
clarity.ms	10
mouseflow.com	9
cookielaw.org	8
gstatic.com	8
tctm.co	7

62. If a website developer chooses to include Google (or other) services by incorporating the relevant tags into their website, those tags and the resulting services become part of the website as it has been designed by the website developer. Because the tags are an integral part of the website, in my opinion the communications triggered by those tags are incidental to the communications between the user and the website. In making the claim that these communications are not incidental, Mr. Hochman implicitly assumes that a portion of the website (e.g., comprising

[75] I listed all domains and the corresponding number of observed transmissions in my backup materials.

the third-party tags) is somehow unnecessary to the website as it has been designed by the developer. I disagree with such an assumption. When a user visits a website that uses these services, she is interacting with the webpage as an entire product consisting of first- and third-party services and code as it is designed by the website developer and not as independent pieces of code that can be arbitrarily ignored.

63. When a user visits the website that includes a Google tag, her browser transmits information to Google when that tag is executed so that Google can provide the service requested. These transmissions facilitate the user's communications with the website because the third-party services that the website's developer has chosen to install on their site are *part of the website*. The transmissions also facilitate communications between the user and the website since they enable the website to display Google features (e.g., Google Ads) that the website's developer has requested to be displayed and/or enable the website's developer to examine how users interact with said website (e.g., Google Analytics).

2. *Importance Of Analytics Services*

64. Mr. Hochman fails to acknowledge the benefits of Google's analytics services, which allow websites to understand who their users are and how they interact with the website, which is important for developing user-friendly designs.[76] Using these insights, websites can constantly modify their product and understand which features users value. As a result, website developers may consider focusing on developing certain functionalities or adding certain features

[76] See, Garett, Renee et al., "A Literature Review: Website Design and User Engagement," *Online journal of communication and media technologies*, Vol. 6, No. 3, 2016, pp. 1-14, available at https://perma.cc/PPC7-PWCM; Sabanovic, Edin, "How to Use Google Analytics to Improve Your Web Design Projects," *Shopify Partners*, *Shopify*, June 13, 2017, available at https://perma.cc/QG8Y-JYD8.

that might be of interest to users. For example, website developers might notice a substantial flow of users from certain geographical regions and adopt a version of the website in another language. Similarly, using insights from web analytics on the most common interactions of users with their desktop websites and information on the characteristics of users' devices, site owners can adapt their websites to user-friendly mobile versions.[77] The absence of analytics services would prevent websites from receiving important insights on their user base, which would hinder the implementation of user-centric web development.

65. In his report, Mr. Hochman attempts to negate the importance of analytics and advertising services by saying that "a major function of the tracking beacons is to collect highly personal information about users' browsing activities."[78] However, that does not comport with Mr. Hochman's statements outside of this litigation. For example, I reviewed Mr. Hochman's website *https://www.hochmanconsultants.com/*, which I understand is the website of a firm Mr. Hochman founded "to help businesses of all sizes better leverage the opportunities that the Internet provides."[79] On his website, Mr. Hochman encourages websites to "[u]se web analytics to learn from your visitors."[80] For example:

- "[e]very business needs to know: How many visitors come to the site? What are the sources of visitor referrals? What keywords do visitors use? What pages attract the most interest? How many visitors are completing the objective?"[81]

---

77 Tidal, Junior R., "Using Web Analytics for Mobile Interface Development," *New York City College of Technology*, 2013, available at https://perma.cc/Z6Z8-U5MW.

78 Hochman Report, ¶ 3.

79 "About Us: Helping your business leverage the Internet," *Hochman Consultants*, available at https://perma.cc/86E7-A39K.

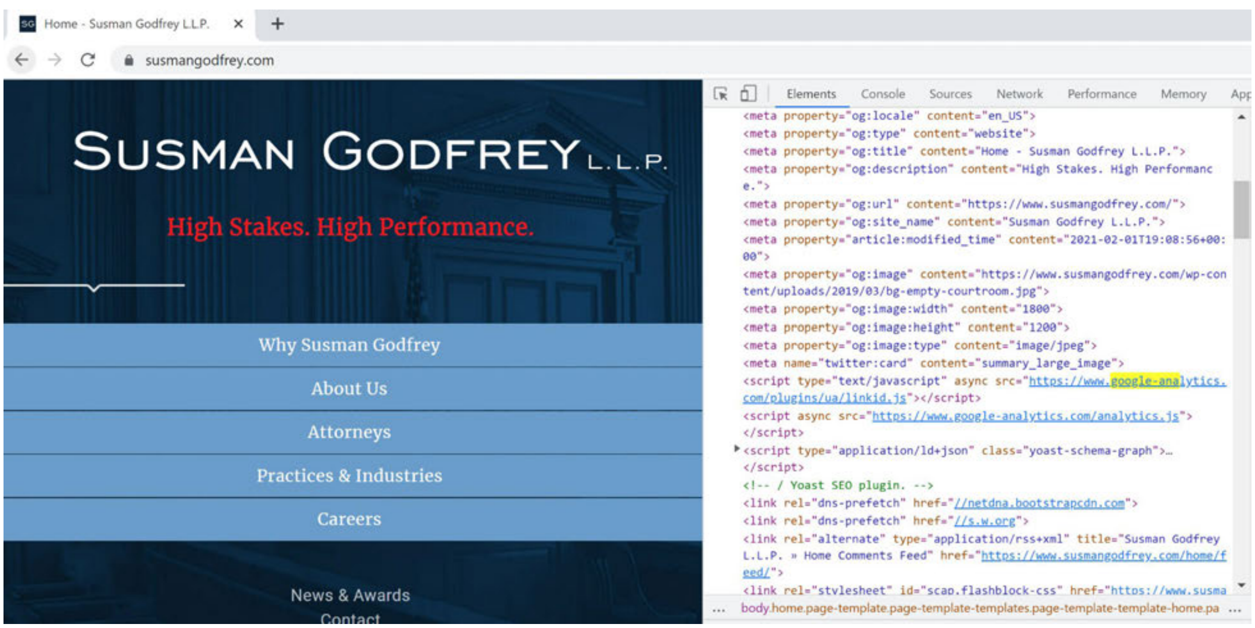
80 "The Internet Marketing Process," *Hochman Consultants*, available at https://perma.cc/Y354-MANZ.

81 "The Internet Marketing Process," *Hochman Consultants*, available at https://perma.cc/Y354-MANZ.

- "[t]hat's just the beginning of what you can learn with web analytics. Depending upon the specific nature of your business, may need to know: the geographic distribution of your visitors, how many customers you lose at each step in your checkout process, or the pages that cause visitors to leave your site."[82]

66. Similarly, the websites for all three Plaintiffs' attorneys Susman Godfrey L.L.P (*https://www.susmangodfrey.com*), Boies Schiller Flexner LLP (*https://www.bsfllp.com*), and Morgan & Morgan Lawyers (*https://www.forthepeople.com*) use a variety of Google services. For example, **Figures 3** through **5** below illustrate the inclusion of Google Tags in websites of all three Plaintiffs' attorneys:

Figure 3
Example Of Google Analytics Tag In Susman Godfrey L.L.P Website



[82] "The Internet Marketing Process," *Hochman Consultants*, available at https://perma.cc/Y354-MANZ.

CONFIDENTIAL – SUBJECT TO PROTECTIVE ORDER

Figure 4
Example Of Google Analytics Tag In Boies Schiller Flexner LLP Website

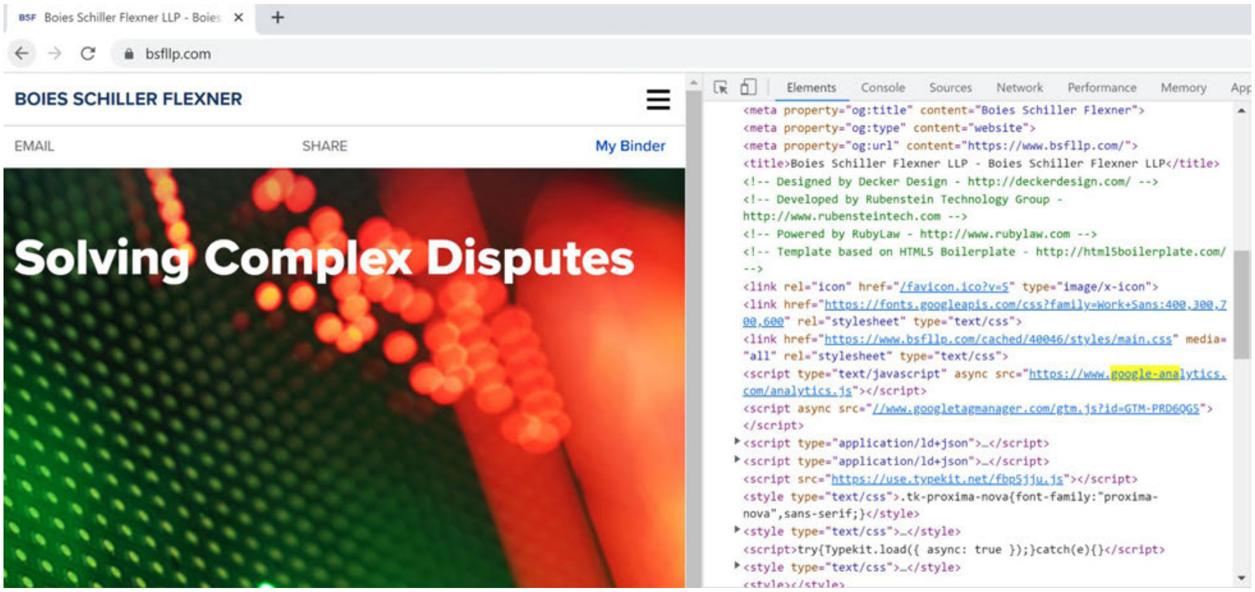
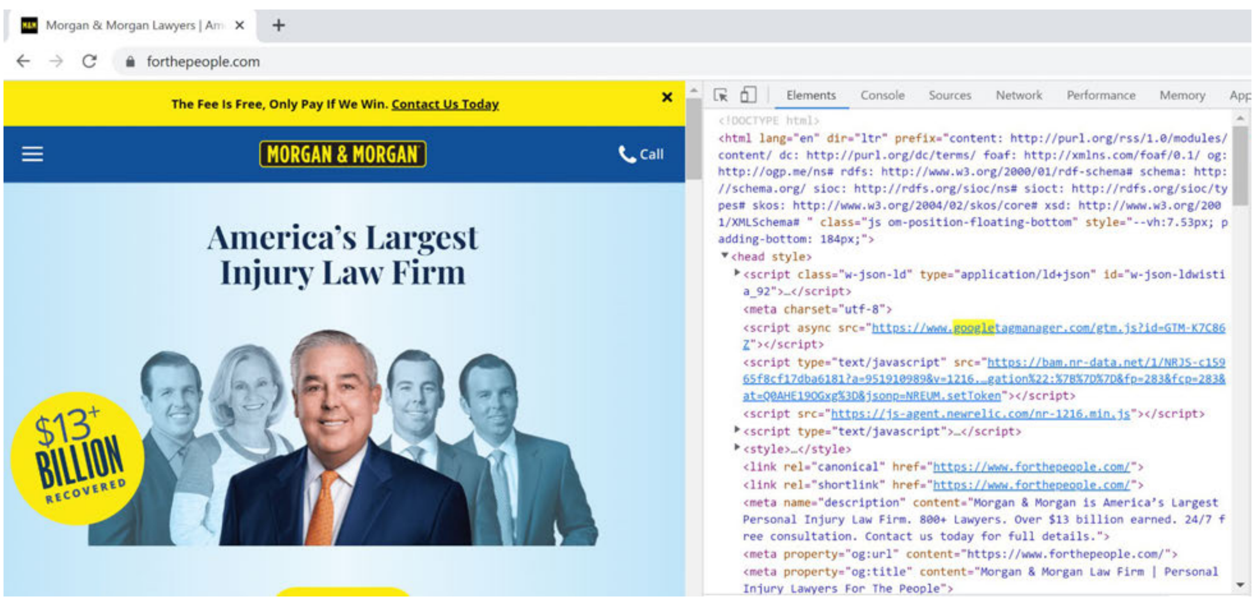


Figure 5
Example Of Google Tag In Morgan & Morgan Lawyers Website



67. The inclusion of Google Analytics in the websites for *all three* of Plaintiffs' law firms—years after they filed this case—illustrates the importance of these services. Since the

inclusion of these tags in a website's source code is a voluntary decision websites make, these services will only be included if the website developers find these services valuable.

3. *Importance Of Advertising To Websites And Users*

68. Digital advertising services are important to optimize efficiency of advertising campaigns, which are an important source of website financing.[83] Advertising revenues allow websites to operate and provide content to users without subscription fees.[84,85] For example, websites' users can access a wide range of free ad-sponsored content that would otherwise be unavailable to them. Such services range from news media—with free websites such as Vox, CNN, and Fox News hosting ads on their sites—to video entertainment—with websites such as Crackle and Peacock offering free ad-supported entertainment.

69. Because advertising provides another revenue stream for website owners and operators, ads expand the size of the online ecosystem, making more resources available to users.[86] One study found that the ad supported internet ecosystem doubled its contribution to the US economy between 2012 and 2016.[87] Online advertising also reduces the cost individual users have

---

83 For instance, in 2020, US newspaper companies generated 39 percent of their advertising revenue from digital advertising. See, "Share of digital in newspaper advertising revenue in the United States from 2011 to 2020," *Statista*, available at https://perma.cc/P88K-7CQK.

84 Klym, Natalie and David Clark, "The Future of the Ad-Supported Internet Ecosystem," *MIT Internet Policy Research Initiative*, 2019, p. 2, available at https://perma.cc/S6LC-KHPJ.

85 For instance, Peacock, a popular video-streaming service, offers a free ad-supported subscription, alongside paid-for ad-free options. See, "Choose a Plan," *Peacock*, available at https://perma.cc/MLK5-GX59.

86 Deighton, John, A., and Leora D. Kornfeld, "Economic Value of the Advertising-Supported Internet Ecosystem," *Interactive Advertising Bureau,* September 2012, available at https://perma.cc/2SS5-CGJK.

87 "Ad-Supported Internet Brings over $1 Trillion to the U.S. Economy, Representing 6 Percent of Country's Total GDP, According to IAB Study Led by Harvard Business School Professor," *Interactive Advertising Bureau*, March 15, 2017, available at https://perma.cc/G9BS-85MJ.

to pay in order to benefit from online content.[88] In addition, advertising is one of the main ways for commercial digital media to generate a profit.[89]

70. In his report, Mr. Hochman presents an example of *The New York Times* website being opened in Firefox Private Browsing Mode without ads.[90] Mr. Hochman fails to acknowledge that his visit to *The New York Times* using Firefox in Private Browsing Mode that did not contain observed ads was possible because many other users *do* observe ads when visiting *The New York Times*. The users who are displayed ads subsidize his ads-free visit. In the absence of ads, users likely would have to pay either higher subscription fees or would not even have access to *The New York Times* online as ads are an important source of revenues required for many websites to keep operating.[91] The academic literature acknowledges the benefits produced by digital ad-supported content, going as far as to discuss whether these benefits should be captured in GDP measures.[92] One estimate, which models consumer surplus by considering leisure time spent on the internet, suggests that free internet services might create over $100 billion in consumer surplus per year in

---

88 Deighton, John, A., and Leora D. Kornfeld, "Economic Value of the Advertising-Supported Internet Ecosystem," *Interactive Advertising Bureau*, September 2012, available at https://perma.cc/2SS5-CGJK.

89 Bekh, Alona, "Advertising-based Revenue Model in Digital Media Market," *Ekonomski vjesnik/Econviews - Review of Contemporary Business, Entrepreneurship and Economic Issues*, Vol. 33, No. 2, 2020, p. 548, available at https://perma.cc/W7QP-YTPM.

90 Hochman Report, ¶ 115.

91 For example, the New York Times derived over $116M in revenue in the first quarter of 2022 from advertising. See, "The New York Times Company Reports First-Quarter 2022 Results," *The New York Times Company*, May 4, 2022, available at https://perma.cc/QR4R-EHP6.

92 See, Nakamura, Leonard, Jon Samuels, and Rachel Soloveichik "Valuing 'Free' Media in GDP: An Experiment Approach," *Federal Reserve Board of Philadelphia Working Paper*, No. 16-24, 2016, available at https://perma.cc/4HMJ-7D3R; Ahmad, Nadim, and Paul Schreyer, "Measuring GDP in a Digitalized Economy," *OECD Statistics Working Papers*, No. 2016/07, 2016, available at https://perma.cc/GNV6-GHRX.

the U.S., corresponding to about 0.74 percent of annual GDP.[93] Another estimate found that welfare gains associated with the expansion of free media goods arising from the advent of digital advertising led to a 2.5 and 2.7 percent increase in welfare in terms of consumption for the non-college- and college-educated population specifically.[94]

71. Mr. Hochman also writes in Appendix A to his report that "[he has] used Google AdWords (now known as Google Ads) since 2003 for hundreds of different clients and thousands of different campaigns."[95] Thus, outside of this litigation, it appears that Mr. Hochman understands and supports the value of Google's advertising services.

E. Mr. Hochman's Assertion That Google Could Have Designed Chrome Differently Is Speculative And Misleading (Hochman Opinion 4)

72. In his Opinion 4, Mr. Hochman asserts that "Google could have at any point before or during the class period, redesigned Chrome Incognito to either stop or limit Google's collection of private browsing information from the private communications between users and non-Google websites."[96] In support of this statement, Mr. Hochman makes numerous speculative assertions without providing any analysis or supporting evidence regarding feasibility of these changes or their impact on usability of the Chrome browser, or potential second-order effects of such changes on other aspects of the market, business, and technology. Mr. Hochman also fails to consider the impact to users if all communications to Google were blocked in Incognito Mode.

---

93 Brynjolfsson, Erik and Joo Hee Oh, "The Attention Economy: Measuring the Value of Free Digital Services on the Internet," *Thirty Third International Conference on Information Systems, Orlando 2012,* 2012, available at https://perma.cc/E2TZ-A6J9.

94 Greenwood, Jeremy et al., "'You Will': A Macroeconomic Analysis of Digital Advertising," *Economics of Digital Services @ Penn*, 2021, available at https://perma.cc/ZX8P-9LC2.

95 Hochman Report, Appendix A, ¶ 31.

96 Hochman Report, ¶ 5.

73. As an initial matter, in asserting that Chrome should be redesigned to "either stop or limit" all transmissions of At-Issue Data to Google when a user visits a website in Incognito Mode, Mr. Hochman assumes that this is what users actually want. As described in my opening report, Private Browsing Modes, including Incognito Mode, are not designed to provide complete anonymity from websites that the user visits and third-party services that these websites have chosen to embed.[97] Mr. Hochman's assertion to the contrary—that Incognito Mode should be designed to prevent Chrome from sending all messages to third-party web services—is not realistic because it ignores the stark negative impact this would have on users. For example, Google provides a number of services like the Google Fonts and Google Maps APIs that are used by numerous websites. Those services are enabled by transmissions to Google-associated domains that necessarily include fields such as IP addresses and user agent strings. If Chrome blocked all such transmissions in Incognito Mode as Mr. Hochman contends, websites would not be able to render the fonts provided by the Fonts API, or display the maps provided by the Maps API, which would negatively impact the experience of users visiting those websites.[98] In offering his opinion on this subject, Mr. Hochman ignores these impacts on the user's browsing experience.

74. Mr. Hochman also relies on selected statements by current and former Google employees that he takes out of context. For example, Mr. Hochman argues that Google could have blocked third-party cookies by default before 2020, relying on the following testimony from former Google Engineer Justin Schuh: "So when you ask me if Google could technically block third-party cookies on – at any point in the history – like, could Chrome had launched without

---

[97] Zervas Affirmative Report, ¶ 43.

[98] See **Appendix E** for an illustration.

third-party cookies, the answer is technically, yes."[99] However, Mr. Hochman fails to include Mr. Schuh's statements immediately preceding this statement ("[T]he hard part is the way that the technical change impacts everything else") and immediately following it ("No one would have ever used it because it would have been a broken browser").[100]

75. Mr. Hochman also mischaracterizes testimony of Google engineer Michael Kleber and product manager Abdel Karim Mardini on the subject of deletion of Incognito Mode session data on Google's servers. Mr. Hochman quotes from Mr. Kleber's deposition testimony to claim that Google never implemented a proposal whereby "[s]erver-side logs will be initially anonymized and then removed at the end of the Incognito session when the user enables this feature."[101] However, Mr. Hochman fails to include Mr. Kleber's remarks on the hypothetical nature of the proposal: "[S]ince the servers don't actually do the thing being described here, the [proposal for] how should Chrome interact with servers that do the thing is a purely hypothetical question because the servers don't actually do the thing being described."[102]

76. Mr. Hochman further mischaracterizes Mr. Kleber's testimony about proposals to "introduce anti-tracking features–including invasive anti-fingerprinting measures" and to mask IP addresses.[103] With regard to anti-tracking features, Mr. Hochman fails to include the following from Mr. Kleber: "I think there were a range of options where deploying [privacy-improving technologies] in Incognito Mode as described here is one option. And another option is deploying this range of protections for everybody, like making it a standard part of Chrome, whether you're

---

99 Hochman Report, ¶ 125.

100 Deposition of Justin Schuh, January 6, 2022, p. 148:12-13, 19-20.

101 Hochman Report, ¶ 126.

102 Deposition of Michael Kleber, March 18, 2022 ("Kleber Deposition"), p. 20:16-20.

103 Hochman Report, ¶¶ 128-129.

in Incognito Mode or not. That second option is the one we ultimately landed on."[104] Mr. Kleber described this as "one of the cornerstones of the Privacy Sandbox effort" that he is involved in.[105] With respect to IP address masking, Mr. Hochman fails to include the following from Mr. Kleber: "There are hard problems that need solving when you -- when you try to add IP privacy. There are things that IP addresses are used for, and if you add IP privacy blindly, then there are a lot of problems that you could cause. So there are many people, both inside of Google and outside of Google, who quite rightly urge caution to avoid accidentally breaking some important parts of the web or of the Internet by adding IP privacy without considering all of the potential consequences."[106]

77. Similarly, Mr. Hochman cites testimony by former Google product manager Rory McClelland to argue that Google could have built a toggle to let users decide whether to signal to Google that they are browsing in Incognito Mode.[107] But Mr. Hochman ignores Mr. McClelland's further testimony about the arguments against such a toggle, including web standards surrounding Private Browsing Modes, which provide that the "web server should be oblivious to the user's private browsing intent, Chrome or otherwise."[108]

78. I also find Mr. Hochman's comparisons between Chrome and other browsers misleading. He uses tracking prevention features in Firefox and Safari as examples of what Google could implement in Chrome, but he ignores that Google provides several settings and extensions (e.g., the Google Analytics Opt-out extension) for users who want to block analytics and

---

[104] Kleber Deposition, p. 28:3-11.

[105] Kleber Deposition, p. 28:11-12.

[106] Kleber Deposition, p. 51:10-21.

[107] Hochman Report, ¶ 131.

[108] Deposition of Rory McClelland, February 18, 2022, p. 91:18-20.

advertising communications on their Chrome browser. Mr. Hochman also compares Chrome's Incognito Mode with Safari's Private Browsing Mode, noting that "Safari's Private Browsing mode was designed to not share cookies across all open windows and tabs."[109] However, Mr. Hochman neglects to mention that Firefox, for example, has a Private Browsing Mode that operates in the same way as Chrome's Incognito Mode in this respect. Similar to Chrome's documentation, Mozilla also clarifies the features included in Firefox's Private Browsing Mode in a page titled "Private Browsing - Use Firefox without saving history."[110] The article states that, "[c]ookies set in private windows are held temporarily in memory, separate from regular window cookies, and discarded at the end of your private session (after the last private window is closed)."[111]

79. My review of the sources Mr. Hochman cites indicates that Google has considered a number of possible changes in the past, including some hypothetical changes that presented a number of technical hurdles. Mr. Hochman's conclusion that Google could have designed Chrome's Incognito Mode differently is speculative, ignores the negative impact these changes would have on users, and is based on selective quotations from witness testimony discussing these possible changes, while ignoring other testimony about their speculative nature and associated technical hurdles. Nor does he acknowledge the changes that Google actually implemented and

---

[109] Hochman Report, ¶ 163.

[110] "Private Browsing - Use Firefox without saving history," *Mozilla Support,* available at https://perma.cc/X9NG-QCB8.

[111] "Private Browsing - Use Firefox without saving history," *Mozilla Support,* available at https://perma.cc/X9NG-QCB8.

continues to work toward implementing, for which there is abundant information available to the public.[112]

IV. REBUTTAL TO MR. HOCHMAN'S ASSERTIONS REGARDING USER AND WEBSITE NOTIFICATIONS

A. Mr. Hochman's Opinions Regarding User Notification And Choice Are Flawed (Hochman Opinion 5)

80. In his Opinion 5, Mr. Hochman asserts that Google "intercepted private browsing communications without notifying users or providing a choice at the time of collection," and that Google "could have provided such a notification but did not."[113] Mr. Hochman further states that "[w]hen visiting a non-Google website containing Google tracking beacons in a private browsing mode, users are not notified of the Google tracking beacons or Google's collection of private browsing information or given a choice regarding that collection."[114] These statements are flawed for several reasons.

81. First, as I discuss in my opening report, when a user opens a Private Browsing Session in any major browser, the Splash Screen informs the user what Private Browsing Mode is and what it is *not*.[115] For example, in the case of Incognito Mode, users are informed that the user's activity will still be visible to websites, employers or school, and internet service providers.[116] The

---

[112] See e.g., "Protecting your privacy online," *The Privacy Sandbox, Google*, available at https://perma.cc/C2TM-927B; and "Google Chrome," *The Keyword*, *Google*, available at https://perma.cc/5QFA-CBFC.

[113] Hochman Report, ¶ 6.

[114] Hochman Report, ¶ 134.

[115] Zervas Affirmative Report, Section IV.B.

[116] Zervas Affirmative Report, ¶ 50.

Incognito Splash Screen also contains a link to more detailed descriptions of Incognito Mode, as I also discuss in further detail in my opening report.[117]

82. Second, Mr. Hochman ignores that Google's policies require websites using Google's services to provide notice to users about the website's collection of data. For example, Google Analytics policies state that websites are responsible for:

- ***User notification***: "You must give your end users proper notice about the implementations and features of Google Analytics that you use, including notice about what data you will collect via Google Analytics, and whether this data can be connected to other data you have about the end user. You must obtain consent from your end users, or otherwise provide them with the opportunity to opt-out from the implementations and features you use."[118]
- ***Types of data transmitted to Google***: "You must not upload any data that allows Google to personally identify an individual (such as certain names, Social Security Numbers, email addresses, or any similar data), or data that permanently identifies a particular device (such as a unique device identifier if such an identifier cannot be reset)."[119]

---

[117] Zervas Affirmative Report, ¶ 52.

[118] "Measurement Protocol, SKD, and User ID Feature Policy," *Google Analytics, Google*, available at https://perma.cc/88W2-LDYD.

[119] "Measurement Protocol, SKD, and User ID Feature Policy," *Google Analytics, Google*, available at https://perma.cc/88W2-LDYD.

83. Similarly, Google Ad Manager's policies for publisher websites clearly state that publisher websites must inform users about any data sharing that occurs as part of using Google Ad Manager:

> "Publishers must: have and abide by a privacy policy that clearly discloses any data collection, sharing and usage that takes place on any site app, email publication of other property as a consequence of your use of Google products. The privacy policy must disclose to users that third parties may be placing and reading cookies on your users' browsers or using web beacons to collect information as a result of ad serving on your website."[120]

84. Additionally, Google Ad Manager's policies state that publishers must "not pass any information to Google data that Google could use or recognize as personally identifiable information; or that permanently identifies a particular device."[121]

85. Third, Mr. Hochman claims that based on his review of the top 25 websites for Google Analytics and the top 25 websites for Google Ad Manager as well as a number of other websites he visited "none of those websites had any such pop-up notification – or any process by which users would be informed that Google would collect and exploit their private browsing information."[122] This assertion is inaccurate. When I visited the same websites in Private Browsing Mode, I found that all provided notices to users about data collection, many including specific references to Google services, and did not indicate or suggest that this data collection would stop

[120] "Google Publisher Policies: Privacy-related policies: Privacy disclosures," *Google Ad Manager Help, Google,* available at https://perma.cc/G2FU-Z7PK.

[121] "Google Publisher Policies: Privacy-related policies: Privacy disclosures," *Google Ad Manager Help, Google,* available at https://perma.cc/G2FU-Z7PK.

[122] Hochman Report, ¶ 134.

when a user browses in a Private Browsing Mode.[123] For example, the following websites disclose data collection in general to users:

- ***Linkedin.com***: "As further described in our Cookie Policy, we use cookies and similar technologies (e.g., pixels and ad tags) to collect data (e.g., device IDs) to recognize you and your device(s) on, off and across different services and devices where you have engaged with our Services."[124]

- ***Businessinsider.com***: "We use cookies for a variety of reasons. Cookies make it easier for you to log on to and use the Sites during visits. The aggregate information collected permits us to analyze traffic patterns and target the interests of our users. This helps us provide you with a better experience by improving the content and making our Sites easier to use. [...] Web beacons allows us, for example, to monitor how users move from one page within our Sites to another, to track access to our communications, to understand whether users have come to our Sites from an online advertisement displayed on a third-party website, to measure how ads have been viewed and to improve site performance. [...] Please note that third parties (including, for example, advertising networks and providers of external services like web traffic analysis services) use cookies, over which we have no control. These cookies are likely to be analytical/performance cookies or targeting cookies."[125]

---

123 **Appendix D** includes the list of the websites that were not accessible for review and screenshots for the websites highlighted in my report. My backup materials include the review of privacy notices for all accessible websites.

124 "Privacy Policy," *LinkedIn*, August 11, 2020, available at https://perma.cc/2TT8-37Q2.

125 "Cookies Policy," *Insider Inc.,* September 4, 2019, available at https://perma.cc/MH9H-5V3Z.

- ***Washingtonpost.com***: "We and our service providers may use cookies, web beacons, and other tracking technologies to collect such information."[126]

86. I also found many examples that explicitly inform users that the websites use Google Analytics. For example:

- ***Change.org***: "We use third-party analytics services like Google Analytics provided by Google Inc. ("Google"), the Amplitude service provided by Amplitude ("Amplitude"), the Optimizely service provided by Optimizely ("Optimizely"), and the Chartio service provided by Chartio ("Chartio"). These analytics services may use cookies and similar technologies to analyze how people use our services and provide statistical reports about aggregate user behavior."[127]

- ***Grammarly.com***: "These cookies track information about your visits and usage of the Site, Software, and/or Services so that we can make improvements and report our performance — for example, to analyze visitor and user behavior so as to provide more relevant content or suggest certain activities. We might also use analytics cookies to test new ads, pages, or features to see how users react to them. Google Analytics is the main technology we currently use in this regard."[128]

- ***Privy.com***: "Please note in particular that we may use Google Analytics and other similar services. Google Analytics uses cookies to help analyze how users use the Site. The information generated by the cookie about your use of the Site (including your IP address) will be transmitted to and stored by Google, Inc. ("Google"). Google may use

[126] "Privacy Policy," *The Washington Post*, October 5, 2021, available at https://perma.cc/5WVW-YRQV.

[127] "Privacy Policy," *Change.org*, March 25, 2022, available at https://perma.cc/G2HG-5AEV.

[128] "Cookie Policy," *Grammarly*, December 30, 2019, available at https://perma.cc/V5MQ-G8B9.

this information for the purpose of evaluating your use of the Site, compiling reports on website activity for website operators and providing other services relating to website activity and internet usage."[129]

87. Further, some websites such as *accuweather.com* also mention the use of ad-related services such as DoubleClick:[130]

> "AccuWeather and third-party vendors, including Google, may use first-party cookies (such as the Google Analytics cookies) and third-party cookies (such as the DoubleClick cookie) together to: (a) inform, optimize and serve ads based on a user's past visits to AccuWeather Sites or (b) report how Your ad impressions, other uses of ad services, and interactions with these ad impressions and ad services are related to visits to AccuWeather Sites."[131]

88. I have tested and confirmed that the website notifications described above are accessible to users in Private Browsing Mode in each of the Chrome, Safari, and Edge browsers.[132] In other words, if someone visits these websites using a Private Browsing Mode of any of the Chrome, Safari, or Edge browsers, these websites' privacy notifications are accessible to the user.

89. Mr. Hochman also ignores that there are websites that display pop-up notifications to users in Incognito Mode informing them of the site's use of Google Services. As I described in my opening report, the Latham and Watkins LLP websites (*lw.com)* shows a pop-up notification that immediately asks users, irrespective of the browsing mode, whether they consent to the use of Google Analytics as illustrated in **Figure 6**.[133]

---

[129] "Privacy Policy," *Privy*, December 20, 2019, available at https://perma.cc/A8HS-5M6E.

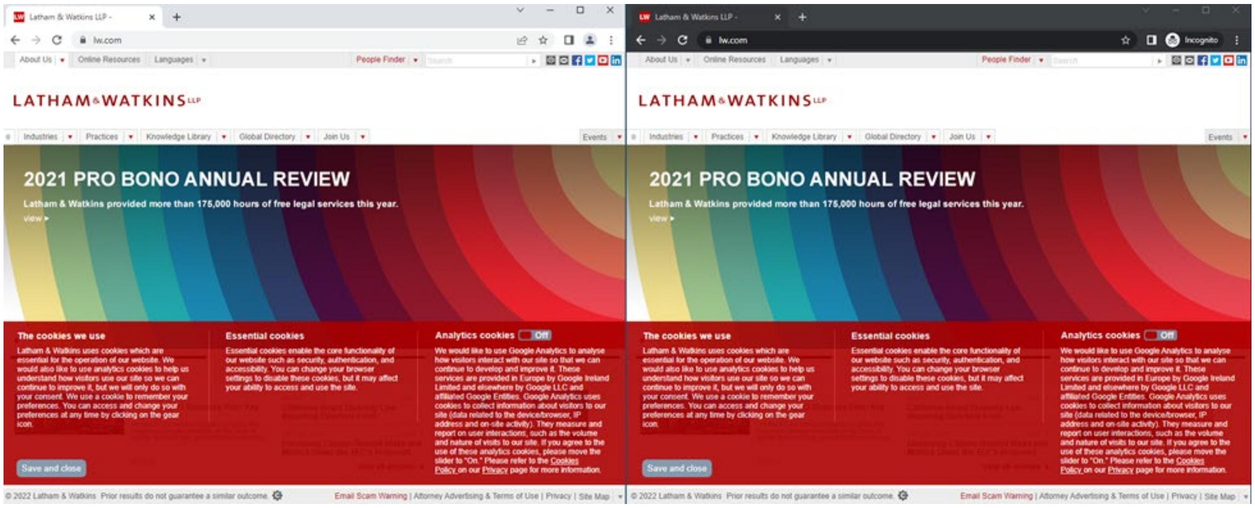
[130] "Privacy Policy," *AccuWeather*, August 21, 2020, available at https://perma.cc/4NT5-WCHW.

[131] "Privacy Policy," *AccuWeather*, August 21, 2020, available at https://perma.cc/4NT5-WCHW.

[132] See **Appendix D** for screenshots.

[133] Zervas Affirmative Report, ¶ 96.

Figure 6
Latham & Watkins LLP Pop-Up Notification Example



90. In asserting that Google did not provide users a choice, Mr. Hochman also neglects that users have a variety of settings and extensions that affect whether At-Issue Data flows to third-party services embedded in websites that the users visit.[134] I also performed tests discussed in my opening report and confirmed that these options function as advertised and restrict transmissions of At-Issue Data to Google.[135] For example, users can block or limit execution of third-party code using built-in browser settings or external extensions. Further, as I also discuss in my opening report, these settings and extensions are applicable in both Regular and Private Browsing Modes, although users may need to enable extensions in Private Browsing Mode.[136] Based on these settings that give users control over transmissions of At-Issue Data to Google when they visit a website that uses a Google service, I disagree with Mr. Hochman's assertion that users are not given a choice in relation to the transmissions of At-Issue Data in this case.

---

[134] Zervas Affirmative Report, Sections V.A.2 and V.B.2.

[135] Zervas Affirmative Report, Section V.D.

[136] Zervas Affirmative Report, ¶ 118.

91. I also disagree with Mr. Hochman's assertion that Google could have provided a notification or offered a choice to users "at the time of collection."[137] This assumes that Google can identify whether a user is in a Private Browsing Mode in Chrome or another browser when they visit a website that uses Google's services; however, as I discuss in **Section IV.B** below, Private Browsing Modes are intended to not be detectable to websites or their third-party web-service providers. Additionally, Mr. Hochman provides no explanation as to how Google would notify users of non-Google browsers such as Safari or Edge "at the time of collection."

B. Mr. Hochman's Opinions Regarding Notifications To Websites Are Flawed (Hochman Opinion 6)

92. In his Opinion 6, Mr. Hochman claims that Google "intercepted private browsing communications without notifying websites or providing a choice at the time of collection."[138] This claim is flawed as it assumes that website owners were unaware of how Private Browsing Modes operate in relation to the third-party services upon which they rely.

93. Mr. Hochman's assertions that websites were not aware of how Private Browsing Mode operates is also contradicted by the fact that websites have expressed concerns about the lack of ability to detect Private Browsing Mode users. For example, news websites such as *The New York Times* have in the past developed strategies to detect (and block) Private Browsing Mode users who could use that browser feature to bypass paywalls.[139] *The New York Times* business

---

[137] Hochman Report, ¶ 135.

[138] Hochman Report, ¶ 7.

[139] Benton, Joshua, "Your favorite way to get around The New York Times paywall might be about to go away," *NiemanLab*, February 28, 2019, available at https://perma.cc/F5ED-BV3H.

model relies on revenues from both subscription and ads channels.[140] Users must buy a subscription to access all content, but users may view a limited number of articles for free. The limit to the number of articles was enforced through the placement of cookies, which allowed *The New York Times* to detect how many articles had recently been viewed from that browser and thus whether the limit was reached. However, since each Private Browsing Session started without any cookies set, visitors in a Private Browsing session would appear to *The New York Times* website to be first-time visitors. This allowed Private Browsing Mode users to bypass the limit on viewing free articles. In response, *The New York Times* developed methods to detect if a website visitor was in a Private Browsing Mode and reimpose the limit of free articles. This example illustrates that websites like *The New York Times* developed methods *precisely* because they were aware that Chrome and other browsers do not reveal the Private Browsing Mode status of a website visitor and how Private Browsing Modes operate. In response to the workarounds to identify whether a website user was in Incognito Mode, Google implemented numerous updates to Chrome to limit the ability of websites to detect Incognito Mode.[141]

94. It is well known in the industry that Private Browsing Modes are designed not to inform websites of users' private browsing status. For example, as described in **Section III.A** above the W3C states that browser vendors should design private browsing modes so that they work in a way that is "indistinguishable" for websites from normal browsing mode.[142] Based on

---

140 Zacks Equity Research, "Subscription Revenues a Key Driver for NY Times (NYT) in 2022," *Yahoo*, December 21, 2021, available at https://perma.cc/BGY8-EHW7.

141 Bradshaw, Kyle, "Google wants to make it harder for sites to detect that you're using Chrome's Incognito Mode," *9to5Google*, February 15, 2019, available at https://perma.cc/QSX5-J6RV.

142 "W3C TAG Observations on Private Browsing Modes," World Wide Web Consortium, April 9, 2020, available at https://perma.cc/8SLY-NZ66.

these public discussions, I expect that website developers are aware that browsers do not identify whether a user is in Regular or Private Browsing Mode.

95. In addition, as I discuss in my opening report, Google's public documentation about its Analytics service also provides an extensive description of how the service works.[143] For example, public documentation describes how websites can enable Google Analytics services[144] and which data can be sent to Google.[145] Notably, I did not find any information in Google Analytics public documentation that suggests that Google Analytics operates differently in Private Browsing Modes. In fact, public documentation implies that Google Analytics operates in Private Browsing Mode. For example, it explains that "[d]ifferent web browsers on the same device, including instances of incognito and private browsing, are counted as unique devices in the Cross Device reports."[146] Thus, based on this publicly available Google document, I expect that Google Analytics customers are aware that the service will attempt to collect information regarding users' visits to the customer's websites, whether or not they do so in Private Browsing Mode.

96. Additionally, it is a common practice to test websites in Private Browsing Modes to see how websites behave when "things like cookies and temp files are not saved."[147] Mr. Hochman has not identified, and I have not seen, any evidence indicating that website developers are not aware that third-party services such as Google's analytics and advertising

---

143 See, Zervas Affirmative Report, Section V.A.

144 See e.g., Zervas Affirmative Report, ¶ 88.

145 See e.g., Zervas Affirmative Report, ¶ 90.

146 "Limits of User-ID view & Cross Device reports," *Analytics Help, Google*, available at https://perma.cc/BAM5-AYUB.

147 "Strategies for carrying out testing," *MDN Web Docs*, available at https://perma.cc/F5G6-KN2C.

services will operate in Private Browsing Modes similarly to how they operate in Regular Browsing Modes.[148]

V. REBUTTAL TO MR. HOCHMAN'S ASSERTIONS REGARDING USER PROFILES (HOCHMAN OPINION 10)

97. In his Opinion 10, Mr. Hochman states that "Google, throughout the class period, created detailed profiles tied to various Google identifiers (that remain undisclosed to users) based on the private browsing information it collected."[149] This statement is flawed as Mr. Hochman ignores that analytics and advertising cookie values sent in Private Browsing Sessions are different from those in Regular Mode Sessions or different Private Mode Sessions, and the cookie values from Private Browsing Sessions cannot be used as a link to the user or her device after the session is closed.

98. The "detailed profiles" Mr. Hochman describes are in fact "orphaned" islands of data reflecting browsing activity from just one Private Browsing Session. The data are associated only with a cookie value that is deleted from the user's browser when she closes the Private Browsing Session.[150] For users who do not sign into their Google Accounts (as the class members here), the cookie values set in Private Browsing Mode cannot be used to link the user's activities in a given Private Browsing Session to the user's activities in other Regular or Private Browsing Sessions.[151] This prevents Google from using these cookie values to create a "cradle-to-grave

[148] As noted in my opening report, Private Browsing Modes restrict certain functionality such as access to cookies and other information from other browser sessions and depending on the browser might block third-party cookies.

[149] Hochman Report, ¶ 11.

[150] Zervas Affirmative Report, ¶¶ 80-84.

[151] In my opening report, I conducted systematic testing of whether cookies are shared between Regular and Private Browsing Sessions for popular browser and operating system combinations. For all testing

profile of users," as Plaintiffs allege.[152] Rather, the purported "profiles" based on cookie values, to which Mr. Hochman refers, reflect at most certain browsing activity (visits to websites that use Google services) by an unidentified user during a single Private Browsing Session.

VI. REBUTTAL TO MR. HOCHMAN'S ASSERTION THAT GOOGLE CIRCUMVENTED COOKIE BLOCKERS AND ANTI-TRACKING MEASURES (HOCHMAN OPINION 15)

99. In his Opinion 15, Mr. Hochman asserts that Google attempted "to circumvent efforts by other companies to block Google tracking beacons."[153] As support for this opinion, Mr. Hochman refers to certain features of Google products that he contends circumvent such technologies as Firefox Private Browsing or Apple's Intelligent Tracking Prevention. However, Mr. Hochman's assertion rests on an incomplete basis and fails to acknowledge various aspects of how these Google products function and the purpose they serve.

1. PPID

100. Based on each of the factors described below, I disagree with Mr. Hochman's broad statements that PPID works to circumvent efforts by other companies to block Google tracking beacons. Instead, PPID is an example of Google providing a feature to publishers that is allowed by the Firefox and Apple technologies to which Mr. Hochman refers.

---

variations, I observed that cookie values stored from prior Regular Mode Sessions are not used in Private Browsing Sessions. Similarly, cookie values set in Private Browsing Session are not carried over to subsequent Regular or Private Browsing Sessions. As a result, these cookie values cannot be used to link the Private Browsing Mode activities to a user or her device after that Private Browsing Session is closed. See, Zervas Affirmative Report, Section IV.C.

152 Third Amended Class Action Complaint, Chasom Brown, et al., v. Google LLC, United States District Court Northern District of California, February 3, 2022 ("Complaint"), ¶ 93.

153 Hochman Report, ¶ 16.

101. First, Mr. Hochman asserts that "[w]ith the loss of certain Google cookies (e.g., due to blocking of certain Google cookies based on Apple's Intelligent Tracking Prevention ('ITP') or Google's [redacted] changes to Chrome Incognito Mode), Google mitigates targeting loss by relying on first-party identifiers, such as the PPID available for Google Ad Manager 360 Publishers."[154] Mr. Hochman asserts that "[t]his identifier is used to identify users that log into publisher websites, and it uniquely identifies a user across all of the user's devices, browsers, and browsing sessions, including private browsing sessions."[155] This is incorrect. PPID is not used to uniquely identify a user across all of their devices, browsers, and browsing sessions. To the contrary, PPID is used for "ad frequency capping, audience segmentation, and other delivery controls across devices," as I explained in my opening report.[156] Mr. Hochman's description ignores the fact that PPIDs are first-party identifiers that are not shared among publishers.[157] Thus, if a user were to sign into two different publishers' websites, even if those publishers both used PPID, the user would not have the same PPID between the two websites. Thus, PPID does not enable a user to be tracked between websites of different publishers and does not serve the same purpose as a third-party cookie.

102. Second, Mr. Hochman fails to consider that PPID is also conditional on websites deciding to use it.[158] Therefore, availability of the PPID to Google depends on (a) a user visiting the website of a publisher that uses PPID; (b) the publisher assigning a PPID for that user, e.g.,

---

[154] Hochman Report, ¶ 187.

[155] Hochman Report, ¶ 187.

[156] Zervas Affirmative Report, ¶ 110.

[157] "About publisher provided identifiers," *Ad Manager Help*, *Google*, available at https://perma.cc/P6WG-YX4S.

[158] Hochman Report, ¶ 187.

when the user signs in to the website; and (c) the publisher deciding to share the PPID with Google. On the last point, if a publisher decides not to share these with Google, these identifiers will not appear anywhere on Google's systems.[159]

103. Third, as explained in public Google documentation describing "How PPIDs Work," "the identifier sent to Ad Manager must be hashed or encrypted such that it is meaningless to Google, and it must not be raw personally identifiable information, a raw third-party ID, or a raw device ID."[160] Therefore, PPID values do not include information that can link to a users' identity.

104. Fourth, Google requires that users have a way to opt out of personalized ads and blocks the use of PPID for users who choose to do so. If Google detects that a user has opted out of personalized ads, "features permitting the use of PPID for targeting ads to the user's web browser will be disabled."[161]

105. Based on the aspects of the PPID features described above, I do not agree that it is a replacement for third-party cookies or that its use circumvents third-party cookie blockers or any other privacy-oriented features of the Firefox and Apple technologies to which Mr. Hochman refers.

---

[159] Zervas Affirmative Report, ¶ 110.

[160] "About publisher provided identifiers," *Ad Manager Help, Google*, available at https://perma.cc/P6WG-YX4S.

[161] "About publisher provided identifiers," *Ad Manager Help, Google,* available at https://perma.cc/P6WG-YX4S.

2. *Enhanced Conversions*

106. Mr. Hochman also offers several incorrect statements regarding "Enhanced Conversions in Analytics and Ads," which he asserts allow non-Google websites to "send personally identifying information such as a user's email address (user's name, home address, and phone number may also be used) to Google to be matched against the same user's Google account information containing the same identifying information."[162] In my opinion, this is incorrect at least because it suggests that this happens to every user. As described in public documentation, enhanced conversion functionality can only be used if a user is signed into Google when they engage with an ad,[163] and also requires that the user enter information (such as an email or a phone number) on the advertiser website.[164] For instance, the enhanced conversions feature could measure a conversion only if a Google signed-in user engages with an ad, then visits the advertiser's website and enters their email address in the advertiser's website (assuming the advertiser utilizes the enhanced conversions feature).

107. Mr. Hochman's assertions regarding enhanced conversions are also misleading because, similar to PPID, before enhanced conversion data are sent to Google data are processed by a hashing algorithm that masks user data.[165] Google summarizes the enhanced conversion functionality as "[w]ith enhanced conversions for web, first-party customer data such as an email address, name, home address, or phone number is captured in your conversion tracking tags, hashed, sent to Google in its hashed form, and then used to match your customers to Google

---

[162] Hochman Report, ¶ 209.

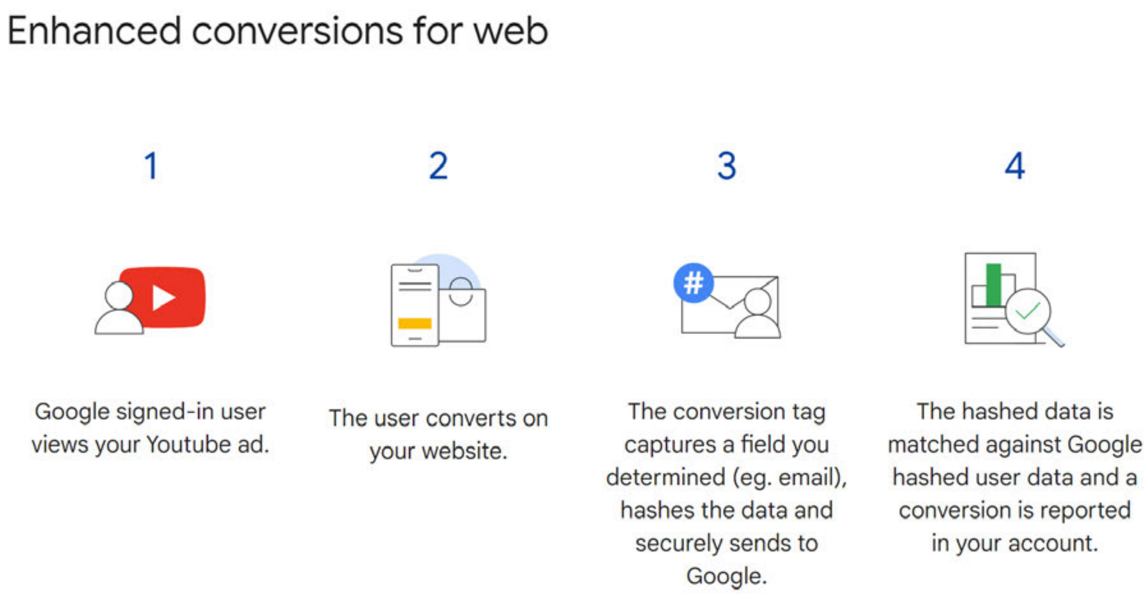
[163] "About enhanced conversions," *Google Ads Help, Google,* available at https://perma.cc/6UH8-9Q7X.

[164] "Set up enhanced conversions for web manually with Google Tag Manager", *Google Ads Help, Google,* available at https://perma.cc/CR99-8WUE.

[165] "About enhanced conversions," *Google Ads Help, Google,* available at https://perma.cc/6UH8-9Q7X.

accounts, which were signed-in to when they engaged with one of your ads." The process of how enhanced conversion operates is also illustrated in **Figure 7** below:[166]

Figure 7
Enhanced Conversion Flow



108. Based on the aspects of the enhanced conversion feature described above, I do not agree that it is a replacement for third-party cookies or that its use circumvents third-party cookie blockers or any other privacy-oriented features of the Firefox and Apple technologies to which Mr. Hochman refers.

[166] "About enhanced conversions," *Google Ads Help, Google,* available at https://perma.cc/6UH8-9Q7X.

VII. REBUTTAL TO MR. HOCHMAN'S OPINIONS REGARDING IMPACT ON USERS (HOCHMAN OPINIONS 26 THROUGH 28)

109. Mr. Hochman asserts three opinions related to his claims that "Google's attempted interception and collection uniformly impacted all class members."[167] In his Opinion 26, he asserts that Google "uniformly attempted to intercept all private browsing communications with non-Google websites that have a Google tracking beacon—regardless of which private browsing mode the user employed."[168] In his Opinion 27, Mr. Hochman asserts that "Google's tracking beacons were so ubiquitous throughout the class period that there is a near certainty that almost every person using the private browsing modes at issue [...] had their private browsing information intercepted by Google, including while visiting non-Google websites without being signed into any Google account."[169] In his Opinion 28, Mr. Hochman asserts that "Google does not offer users any control to escape Google's tracking beacons," which according to Mr. Hochman are "almost impossible to avoid."[170] As described below, these statements are incorrect.

110. Mr. Hochman asserts that "Google's attempted interception and collection uniformly impacted all class members,"[171] and that "Google designed its tracking and advertising code to be embedded on any website and to be agnostic to the specific browser and device for web browsing."[172] I disagree with these assertions. As detailed in my opening report and further described herein, there are multiple browser settings and extensions available to users that will affect transmissions of At-Issue Data to Google when the user visits a website that makes use of

[167] Hochman Report, Section VIII.I.

[168] Hochman Report, ¶ 27.

[169] Hochman Report, ¶ 28.

[170] Hochman Report, ¶ 29.

[171] Hochman Report, Section VIII.I.

[172] Hochman Report, ¶ 308.

Google's analytics or advertising services. The tags that Google makes available to websites that choose to use those services are also configurable, and there are multiple settings available to those websites that also affect transmissions of At-Issue Data to Google. As a result, to the extent there is an "impact" on purported class members of the transmissions of At-Issue Data in this case, I do not agree that any such impact is "uniform" to all class members, as Mr. Hochman contends.

111. Mr. Hochman further asserts that "Google does not provide users with any tool to escape these Google 'tracking beacons' on non-Google websites."[173] This is incorrect, too. Google and other browser vendors *do* provide tools to users that will affect the flow of At-Issue Data to Google. In Section V of my opening report, I summarized settings and extensions that allow users to change which data are transmitted to Google and other services. In my analysis, I tested the following tools that affect data flow: cookie blocking settings, JavaScript blocking settings and extensions, an extension that allows restricting Google Analytics data flow, and an extension that blocks advertising and other types of content. I found that these tools affect data transmissions of At-Issue Data to Google whether a user is in Regular or Private Browsing Mode.[174] Even though my analysis is focused on the Chrome browser using the Windows operating system, similar settings and extensions are available on other browsers and operating systems which makes my analysis generalizable to other cases.[175] The analysis presented in my report serves as an example and was not intended as an exhaustive list of settings and extensions that users can use that are

173 Hochman Report, ¶ 312.

174 Zervas Affirmative Report, Section V.

175 See e.g., "Google Analytics Blocker," *Firefox Browser Add-Ons*, available at https://perma.cc/L3RX-X2A6; Orgera, Scott, "How to Disable JavaScript in Firefox," *Lifewire*, December 2, 2020, available at https://perma.cc/5GLL-U868.

available in all popular browsers. Some users do indeed use these tools.[176,177] Therefore, I disagree with Mr. Hochman that users cannot affect whether and how At-Issue Data are transmitted to Google while users are in Private Browsing Mode, and I disagree with Mr. Hochman that "there is a near certainty that almost every person" had their private browsing information transmitted to Google.

112. Mr. Hochman also states that "[t]he Plaintiffs in this case are alleging that Google portrayed private browsing mode, including Incognito mode, as the control to prevent Google from tracking them across non-Google websites."[178] Other than reference to the Plaintiffs' allegations, Mr. Hochman does not provide support for this assertion. As confirmed by the testing described in my opening report, and as stated in **Section VIII** of this report, Private Browsing Modes in Chrome and other browsers operate consistently with how Google describes their operation to users. Further, to the extent Mr. Hochman asserts that Incognito Mode does not provide any privacy protections to users, I disagree. Incognito Mode *does* provide a measure of control and privacy for the user. For example, as described in **Section VIII** of this report, in Incognito mode, cookies existing on the browser are not shared, and new cookies set during the Incognito Mode session are discarded at the end of the session. Therefore, cookies cannot be used to link the user's activity in Incognito Mode with cookie values set in other sessions.

---

176 Zervas Affirmative Report, ¶ 136.

177 Schneier, Bruce, "Data and Goliath: The Hidden Battles to Collect Your Data and Control Your World," W.W. Norton & Company, 2015, p. 40.

178 Hochman Report, ¶ 312.

VIII. REBUTTAL TO MR. HOCHMAN'S ASSERTIONS REGARDING HOW CHROME'S INCOGNITO MODE OPERATES (HOCHMAN OPINION 29)

113. In his Opinion 29, Mr. Hochman claims that "Google's Chrome Incognito mode functioned in ways that were different than represented." Mr. Hochman further claims that "the Incognito Splash Screen represents that 'Chrome won't save the following information: Your browsing history, cookies and site data, information entered in forms.' This statement is false as a technical matter."[179] Mr. Hochman's sole basis for saying that is that he claims "Chrome does save browsing history as well as cookies and site data within Incognito sessions—at a minimum for the duration of the Incognito session."[180] I disagree with Mr. Hochman's statements on these issues for several reasons.

114. First, Mr. Hochman's assertion that data are saved for the duration of the Incognito Mode session is exactly how Google describes Incognito Mode in various publicly available documents.[181] Specifically, Mr. Hochman ignores descriptions from the "Learn More" page that is linked from the Incognito Mode Splash Screen. The "Learn More" page states that "When you first open a new Incognito window, you're creating a new Incognito browsing session. Any Incognito windows you open after that are part of the same session. You can end that Incognito session by closing all open Incognito windows."[182] Further, under the "What Incognito mode does" section, the "Learn More" page states that "[e]ach time you close all Incognito windows, Chrome

---

179 Hochman Report, ¶ 320.

180 Hochman Report, ¶ 320.

181 Hochman Report, ¶ 320.

182 "How Chrome Incognito keeps your browsing private," *Google Chrome Help, Google*, available at https://perma.cc/2YZX-VG2U.

discards any site data and cookies associated with that browsing session."[183] Further, the Chrome Privacy Notice states that "Chrome won't share existing cookies with sites you visit in incognito or guest mode. Sites may deposit new cookies on your system while you are in these modes, but they'll only be stored and transmitted until you close the last incognito or guest window."[184] Mr. Hochman's description of how Incognito Mode operates is exactly how Google describes it.

115. Second, the tests I conducted and discussed in Section IV.C.2 of my opening report show that Private Browsing Modes, including Incognito Mode, prevent cookie values from being shared across browsing sessions. Chrome keeps cookie values associated with an individual Incognito Mode Session separate from cookie values set in other sessions, whether those are Incognito Mode or Regular Mode Sessions. My testing confirmed that cookie values set in a Regular Mode Session are not available in a Private Browsing Session, and cookie values set during a Private Browsing Session are not available in subsequent Regular Mode or Private Browsing Sessions. Further, my tests also show that users' browsing history, website logins, and autofill web forms are discarded after a Private Browsing Session has ended.[185] My tests confirmed that Private Browsing Modes such as Incognito work as described to users. Mr. Hochman does not perform any tests that show otherwise. For example, Mr. Hochman did not perform any tests or identify any evidence showing that cookie values associated with Private Browsing Sessions are not discarded once the session is closed, or that Incognito Mode does not conceal a user's browsing activity from other people who may use the same device.

---

[183] "How Chrome Incognito keeps your browsing private," *Google Chrome Help, Google*, available at https://perma.cc/2YZX-VG2U.

[184] "Google Chrome Privacy Notice," *Google*, September 23, 2021, available at https://perma.cc/SX4Q-3YU4.

[185] Zervas Affirmative Report, Section IV.A.

116. My tests also confirmed that Private Browsing Modes such as Incognito operate consistent with industry recommendations relating to private browsing. As noted by W3C[186] and discussed in my opening report,[187] "Privacy modes offer some layer of isolation from browsing in regular browsing mode. Specifically, state information (cookies, saved passwords, list of visited sites, and other forms of client-side storage) is not kept between browser sessions. This for example means that on-disk traces should not be retained by the browser between two sessions (which in some cases may potentially still be recovered by other means)."[188]

117. Third, Mr. Hochman asserts that "throughout the class period, Chrome Incognito mode did not sandbox individual windows and tabs. Instead, Google designed Chrome Incognito to function in a way where cookies were shared across all Incognito windows and tabs open at the same time."[189] But this is exactly how Google describes Incognito Mode to users. For example, the "How Chrome Incognito keeps your browsing private" page states "Close all Incognito windows and tabs when you're done browsing. You end a session when you close all Incognito windows, so closing a single tab won't discard your data. If you see a number next to the Incognito icon on your desktop or at the bottom of your browser on a mobile device, you have more than one Incognito window or tab open."[190]

---

186 "W3C TAG Observations on Private Browsing Modes," *World Wide Web Consortium*, April 9, 2020, available at https://perma.cc/8SLY-NZ66.

187 Zervas Affirmative Report, Section IV.D.

188 "W3C TAG Observations on Private Browsing Modes," *World Wide Web Consortium*, April 9, 2020, available at https://perma.cc/8SLY-NZ66.

189 Hochman Report, ¶ 162.

190 "How Chrome Incognito keeps your browsing private," *Google Chrome Help, Google*, available at https://perma.cc/2YZX-VG2U.

118. Finally, to support these arguments, Mr. Hochman provides an incomplete quote from a former Google engineer, Rory McClelland, in which he omits the text in bold below:

> "I would argue that we do store it, just in memory only. One of main misunderstanding (sic) we have with IM is with people not closing their sessions, which would be reasonable if they believed we never store the data. **'Storage' is different from writing to disk, in my opinion at least. Whilst this doesn't make much difference at the local level,** it does have an impact on the accumulation of cookies (and sign-ins) that allow the user to be tracked, even in Incognito mode."[191]

119. Mr. McClelland's testimony indicates that there is a distinction between Chrome storing data temporarily in memory versus writing data to disk. I agree. Browsers can store information in temporary memory to enable the browser to function—for example, when a user navigates to a web page, the browser will request and receive the HTML source code for that page. The browser can store the received HTML source code in memory so that it can be executed and the web page rendered for the user. In my opinion, these types of storage are distinct from "saving" information associated with a user's browsing session, which implies that it will be retained even after the browser application is closed. Mr. Hochman has identified no evidence that Chrome Incognito Mode saves a user's browsing history, cookies and site data, or information entered in forms so that it can be accessed after an Incognito Session ends. To the extent Mr. Hochman contends that storing information temporarily in memory constitutes "saving" that information, I disagree.

120. Based on my experience, review of documents, and testing results discussed above and in my opening report, Incognito Mode works as described to users by concealing users' browsing activity from other people who may use the same device, and by ensuring that cookie

---

[191] GOOG-BRWN-00699213.

values generated during the Private Browsing Sessions cannot be used to provide a link to the user's browsing activity in Regular Mode.

IX. OTHER REBUTTALS TO MR. HOCHMAN'S REPORT

A. Mr. Hochman Exaggerates The Complexity Of Developer Tools

121. Mr. Hochman argues that Developer Tools[192] "are not designed for the use by typical Internet users, and they in any case do not provide information regarding exactly what private browsing information is collected by Google, what private browsing information is stored by Google, and/or how that private browsing information is exploited by Google."[193] Mr. Hochman further claims that "[i]n my experience, those are not tools that any typical consumer would use or understand."[194] Mr. Hochman fails to explain what kind of experience makes him come to this conclusion, and he offers no support as to who a "typical user" is and what technology experience they have.

122. While Developer Tools are designed for use by website developers, these tools are accessible to all users. For example, Developer Tools of Chrome and other browsers are accessible to a user with just two clicks. When a user right-clicks on the webpage in Chrome, a menu bar is displayed with a limited number of fields, one of which is "Inspect" as is illustrated in **Figure 8** below. After clicking on the "Inspect" field, the Chrome Developer Tools window will be opened. Alternatively, users can navigate to Developer Tools in Chrome by clicking on the three vertical

---

192 I refer to Developer Tools as a collection of website inspection tools available in all popular browsers. See e.g., "Chrome DevTools," *Chrome Developers, Google,* available at https://perma.cc/9T24-5L9C; "What are browser developer tools?" *MDN Web Docs*, available at https://perma.cc/SL8Y-WSFP.

193 Hochman Report, ¶ 135.

194 Hochman Report, ¶ 87.

dots at the top right corner of the Chrome browser, expanding the "More tools" sub-menu, and clicking on "Developer Tools," or by simply pressing "Ctrl + Shift + I," as illustrated in **Figure 9**.

Figure 8
Accessing Developer Tools In Chrome Via "Inspect"

Figure 9
Accessing Developer Tools In Chrome Via "Ctrl+Shift+I"

123. Mr. Hochman also uses Developer Tools in his analysis of data that Chrome transmits to various domains in Incognito Mode, yet fails to explain why Developer Tools are adequate for that purpose but not others.[195] In my opening report, I used Chrome Developer Tools to illustrate the types of data, such as cookie values, that are stored and transmitted when browsing in Regular and Incognito Modes.[196] Observing that certain data are sent to Google when browsing a non-Google website does not require in-depth understanding of web technologies; a user can just type "google" in the respective search bar in the "Network tab" of Developer Tools as I illustrated in **Figure 10**. In fact, Chrome Developer Tools offers a "Help" webpage, accessible via a menu in

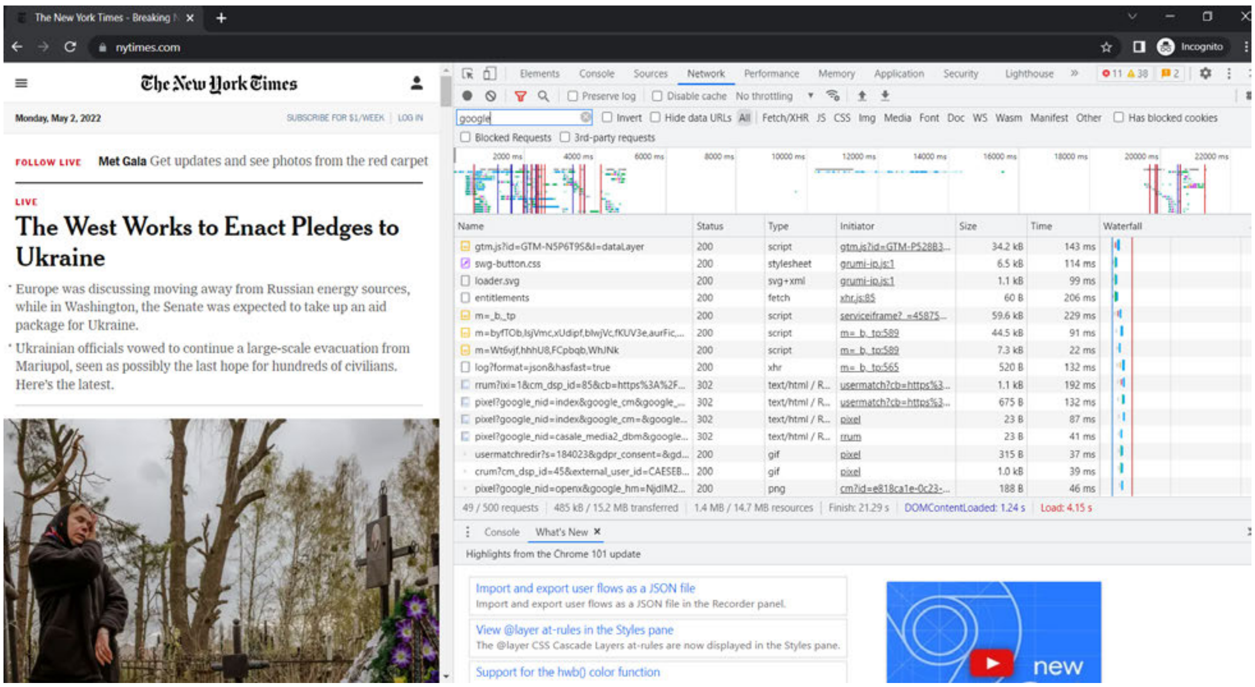
---

[195] Hochman Report, ¶ 87.

[196] See e.g., Zervas Affirmative Report, ¶¶ 63, 65-66.

the Developer Tools window, which explains the program to unfamiliar users.[197] Additionally, the "Inspect Network Activity" page includes a video explaining how to search for specific transmissions.[198]

Figure 10
Searching For Google-Related Transmission



124. While many users may not be inclined to use Developer Tools, some users will. For example, users who want to review the technical details of a particular webpage or are interested in learning how websites and browsers work may use these tools to observe HTTP transmissions or view website source code. There are ample resources and support information available about Developer Tools and how to use them, such that holding a technical degree or having a deep

[197] "Chrome DevTools," *Chrome Developers, Google,* available at https://perma.cc/9T24-5L9C.

[198] "Inspect network activity," *Chrome Developers, Google*, February 8, 2019, available at https://perma.cc/96JX-HTQF.

technical background is not required for someone to use these tools. Therefore, I disagree with Mr. Hochman's conclusions regarding the complexity of and information available to users of Developer Tools.

B. Mr. Hochman's Statements About Energy Saving And Performance Of Websites Related To Google's Analytics And Advertising Services Are Flawed

125. Mr. Hochman argues that "Google's tracking beacons embedded in non-Google websites take up processing, storage, and power/battery resources to run on user devices; thereby increasing user's energy and device costs."[199] Mr. Hochman's support for this conclusion is a single article, which does not even mention Google's analytics and advertising services.[200]

126. This statement also assumes, without foundation, that in the absence of Google services, websites would not use other services to provide the same or similar functionality. As I explained in my opening report,[201] there are multiple alternatives that provide the same or similar functionality as the Google services at issue in this case, such as Hotjar,[202] Mixpanel,[203] Matomo,[204] Piwik PRO,[205] and Adobe Analytics.[206] Thus, I disagree with Mr. Hochman's

199 Hochman Report, ¶ 94.

200 Pearce, Joshua, M., "Energy Conservation with Open Source Ad Blockers," *MDPI,* Vol. 8, No. 2, 2020, available at https://perma.cc/USH9-AQ8F.

201 Zervas Affirmative Report, ¶ 87.

202 "Understand how users behave on your site, what they need, and how they feel, fast," *Hotjar*, available at https://perma.cc/PFP2-TD6F.

203 "Build Better Products," *Mixpanel*, available at https://perma.cc/7AV6-ZBHZ.

204 "Google Analytics alternative that protects your data and your customers' privacy," *Matomo*, available at https://perma.cc/2FG3-BHM7.

205 "Analyze the customer journey across websites and apps," *PIWIK PRO,* available at https://perma.cc/7MRA-9CBF.

206 "Analytics Anywhere in the Customer Journey," *Adobe Analytics*, *Adobe*, available at https://perma.cc/6DYL-5AH4.

assumption that browsers would somehow operate more efficiently if websites did not use Google's services.

127. Also, as confirmed by my testing that I present in my opening report, visiting a website typically triggers many other requests beyond the requests to the first-party website and Google. Therefore, Mr. Hochman wrongfully associates all these negative consequences with Google. As an illustrative example, when I visited Plaintiffs' attorneys' website *http://www.forthepeople.com/* in Incognito Mode, only 11 percent of the third-party transmissions were to Google-associated domains. This is lower than the number of transmissions to another third-party domain *wistia.com*, which provides video hosting services and accounts for 33 percent of the third-party transmissions.[207,208]

C. Mr. Hochman's Assertion That Users Cannot Request Deletion Of Private Browsing Data Incorrectly Assumes That Google Can Identify Specific Users Associated With The Data

128. Mr. Hochman argues that "[b]ased on my own experience as a Chrome user, and as confirmed by Halavati, Google does not give users the option to delete this data" that Google receives "when a user is in private browsing mode."[209] However, Mr. Hochman's opinion incorrectly assumes that Google can identify the specific users associated with browsing data from Private Browsing Sessions. But it is precisely because cookie values from Private Browsing Sessions in which the user does not sign into a Google account cannot be used as a link to the user or her device after the session is closed that the users are not able to delete that activity. As

---

[207] "The Video Host with the Most," *Wistia,* available at https://perma.cc/BR2B-UZ9W.

[208] I listed all domains and the corresponding number of observed transmissions in my backup materials.

[209] Hochman Report, ¶ 103.

Mr. Halavati explained, data from Private Browsing Sessions "are not connected to a user identity" and therefore Google cannot give users the option to delete this information "because it doesn't know to which user they belong."[210] Indeed, Mr. Hochman's implicit assertion that Google should give users the ability to delete data generated while they were in Private Browsing Mode would *require* Google to associate that data with the users' Google accounts (including their email addresses and other potentially identifying information), thereby *reversing* that privacy-enhancing feature of Incognito Mode.

Signed on the 7th day of June, 2022, at Brookline, MA.

Georgios Zervas

[210] Deposition of Ramin Halavati, January 18, 2022, p. 89:2-3.

Georgios Zervas

Boston University
Questrom School of Business
595 Commonwealth Ave (Ofc. 605)
Boston, MA 02215

Phone: (617) 358-3319 (office)
Email: zg@bu.edu
Homepage: http://people.bu.edu/zg/
Google Scholar: https://scholar.google.com/citations?user=5L8vEA4AAAAJ

Last updated: Dec. 21, 2021

Employment & Affiliations

Current

Associate Professor of Marketing 2019–to date
Questrom School of Business, Boston University, Boston, MA

Faculty Director, MS in Business Analytics 2019–to-date
Questrom School of Business, Boston University, Boston, MA

Founding Member, Faculty of Computing & Data Science 2019–to date
Boston University, Boston, MA

Affiliated Faculty in Computer Science 2016–to date
Boston University, Boston, MA

Visiting Researcher 2013–to date
Microsoft Research New England, Cambridge, MA

Prior

Assistant Professor of Marketing 2013–2019
Questrom School of Business, Boston University, Boston, MA

Visiting Scholar Spring 2018
MIT Sloan, Cambridge, MA

Simons Postdoctoral Fellow 2011–2013
Yale University, New Haven, CT
Advisor: Joan Feigenbaum

Affiliate at the Center for Research & Computation in Society 2011–2013
Harvard University, Cambridge, MA

Research Scientist 2006–2012
CogoLabs Inc., Cambridge, MA, USA

Cofounder 2000–2005
Perlfect Solutions, London, UK

Education

Ph.D. Computer Science 2005–2011
Boston University, Boston, MA, USA.
Thesis: Data-Driven Analysis of Electronic Commerce Systems.
Advisors: John W. Byers (BU) & Michael Mitzenmacher (Harvard).

M.A. Interactive Media 1999–2000
London College of Communication, London, UK.
Thesis: Automatic Website Generation Using Genetic Algorithms.
Advisor: Alan Sekers.

M.Sc. Computer Science 1998–1999
Imperial College, London, UK.
Thesis: Thesis: Advanced Clustering Algorithms.
Advisor: Stefan Rüger.

B.Eng. Computer Science 1995–1998
Imperial College, London, UK.
Thesis: Object Linking & Embedding for Linux.
Advisor: Steffen van Bakel.

Publications

Journals

1. Shrabastee Banerjee, Chris Dellarocas Chris, and Georgios Zervas
   Interacting User-Generated Content Technologies: How Questions and Answers Affect Consumer Reviews.
   Journal of Marketing Research, (2021);58(4): 742-761.

2. Georgios Zervas, Davide Proserpio, and John W. Byers
   A first look at online reputation on Airbnb, where every stay is above average
   Marketing Letters, (2020): 1-16.

3. Giana Eckhardt, Mark Houston, Baojun Jiang, Cait Lamberton, Aric Rindfleisch, and Georgios Zervas
   Marketing in the Sharing Economy
   Journal of Marketing, 83.5 (2019): 5-27.

4. Giana Eckhardt, Mark Houston, Baojun Jiang, Cait Lamberton, Aric Rindfleisch, and Georgios Zervas
   Marketing in the Sharing Economy
   Journal of Marketing, 83.5 (2019): 5-27.

5. Davide Proserpio, Wendy Xu, and Georgios Zervas
   You Get What You Give: Theory and Evidence of Reciprocity in the Sharing Economy
   Quantitative Marketing and Economics, 16(4), (2018): 371-407.

6. Georgios Zervas, Davide Proserpio, and John W. Byers
   The Rise of the Sharing Economy: Estimating the Impact of Airbnb on the Hotel Industry
   Journal of Marketing Research, 54, no. 5 (2017): 687-705.
   – Finalist for the 2018 Paul E. Green Award.

7. Davide Proserpio and Georgios Zervas
Online Reputation Management: Estimating the Impact of Management Responses on Consumer Reviews
Marketing Science, 36, no. 5 (2017): 645-665
– Finalist for the 2018 John D. C. Little Award.

8. Michael Luca, and Georgios Zervas
Fake It Till You Make It: Reputation, Competition, and Yelp Review Fraud
Management Science, 62, no. 12 (2016): 3412-3427

Full Papers in Peer-reviewed Conferences with Proceedings

1. Ceren Budak, Sharad Goel, Justin M. Rao, and Georgios Zervas
Understanding Emerging Threats to Online Advertising
In *Proceedings of the Sixteenth ACM Conference on Economics and Computation (EC '16)*. ACM, 2016.

2. John Byers, Michael Mitzenmacher, and Georgios Zervas
The Daily Deals Marketplace: Empirical Observations and Managerial Implications
In *ACM SIGecom Exchanges, Vol. 11, No. 2, December 2012, Pages 29–31*.

3. Joan Feigenbaum, Michael Mitzenmacher, and Georgios Zervas
An Economic Analysis of User-Privacy Options in Ad-Supported Services
In *Proceedings of the 8th Workshop on Internet & Network Economics*, WINE '12, pages 30–43. Springer Berlin Heidelberg, 2012.

4. John W. Byers, Michael Mitzenmacher, and Georgios Zervas
The Groupon Effect on Yelp Ratings: A Root Cause Analysis
In *Proceedings of the 13th ACM Conference on Electronic Commerce*, EC '12, pages 248–265. Valencia, Spain, 2012. ACM.

5. John W. Byers, Michael Mitzenmacher, and Georgios Zervas
Daily Deals: Prediction, Social Diffusion, and Reputational Ramifications
In *Proceedings of the 5th ACM international conference on Web Search and Data Mining*, WSDM '12, pages 543–552. Seattle, WA, USA, 2012. ACM.

6. John W. Byers, Brent Heeringa, Michael Mitzenmacher, and Georgios Zervas.
Heapable Sequences and Subsequences
In *Proceedings of the Workshop on Analytic Algorithmics and Combinatorics*, ANALCO '11, pages 33–44, San Fransisco, CA, USA, 2011. ACM.

7. John W. Byers, Michael Mitzenmacher, and Georgios Zervas
Information asymmetries in pay-per-bid auctions
In *Proceedings of the 11th ACM conference on Electronic Commerce*, EC '10, pages 1–12, New York, NY, USA, 2010. ACM.

8. John W. Byers, Michael Mitzenmacher, and Georgios Zervas
Adaptive Weighing Designs for Keyword Value Computation
In *Proceedings of the third ACM international conference on Web search and data mining*, WSDM '10, pages 331–340, New York, NY, USA, 2010. ACM.

9. Nikolaos Laoutaris, Georgios Zervas, Azer Bestavros, and George Kollios
The Cache Inference Problem and its Application to Content and Request Routing
In *Proceedings of the 26th Annual IEEE Conference on Computer Communications*, INFOCOM '07, pages 848–856, Anchorage, AK, USA, 2007. IEEE.

10. Georgios Zervas, and Stefan M. Rüger
The Curse of Dimensionality and Document Clustering
In *IEEE Seminar, Searching for Information: Artificial Intelligence and Information Retrieval Approaches*, pages 19/1–19/3, Glasgow, UK, 1999.

Abstracts in Peer-reviewed Conferences with Proceedings

1. Greg Lewis and Georgios Zervas
The Supply and Demand Effects of Review Platforms
In *Proceedings of the 2019 ACM Conference on Economics and Computation (EC '19).*, pp. 197-197. ACM, 2019.

2. Shrabastee Banerjee, Chris Dellarocas, and Georgios Zervas
Interacting User Generated Content Technologies: How Q&As Affect Ratings & Reviews
In *Proceedings of the 2017 ACM Conference on Economics and Computation (EC '17).*, pp. 539-539. ACM, 2017.

3. Georgios Zervas, Davide Proserpio, and John W. Byers
The Impact of the Sharing Economy on the Hotel Industry: Evidence from Airbnb's Entry Into the Texas Market
In *Proceedings of the 2015 ACM Conference on Economics and Computation (EC '15).*, pp. 637-637. ACM, 2015.

4. Davide Proserpio and Georgios Zervas
Online Reputation Management: Estimating the Impact of Management Responses on Consumer Reviews
In *Proceedings of the 2015 ACM Conference on Economics and Computation (EC '15).*, pp. 79-79. ACM, 2015.

Invited Articles

1. Davide Proserpio and Georgios Zervas
Replying to Customer Reviews Results in Better Ratings
Harvard Business Review, Feb. 14, 2018.

Working Papers

1. Greg Lewis, Bora Ozaltun, and Georgios Zervas
Maximum Likelihood Estimation of Differentiated Products Demand Systems

2. Luis Armona, Greg Lewis, and Georgios Zervas
Learning Product Characteristics and Consumer Preferences from Search Data

3. Stephan Seiler, Song Yao, Georgios Zervas
Causal Inference in Word-of-Mouth Research: Methods and Results

4. Chiara Farronato and Georgios Zervas
Consumer Reviews and Regulation: Evidence from NY Restaurants

5. Greg Lewis and Georgios Zervas
The Welfare Impact of Consumer Reviews: A Case Study of the Hotel Industry

6. Greg Lewis and Georgios Zervas
Supply and Demand Responses to Consumer Review Platforms

Grants, Awards, & Honors

1. Marketing Science Institute (MSI) Young Scholars — 2019
2. Dean's Research Scholar, Questrom School of Business — 08/2018
3. Shahdadpuri Research Award, Questrom School of Business — 10/2017
4. Hariri Institute Graduate Fellowship — 6/2015
   ($25,000 award)
5. Google Faculty Research Award — 2/2015
   ($35,000 unrestricted gift, plus $10,000 in Google Cloud credits)
6. Hariri Institute Junior Faculty Fellow — 2013–2015
7. Hariri Institute Research Grant — 1/2013
   Principal Investigator, with co-PI John W. Byers ($26,500)
8. Departmental Research Achievement Award, Computer Science Dept., Boston U. — 2010–2011

Student Advising

1. Hannah Catabia, PhD Student, Computer Science Dept., Co-advisor — 2019–to date
2. Philip Zhao, PhD Student, Marketing Dept., Advisor — 2018–to date
3. Shrabastee Banerjee, PhD Student, Marketing Dept., Advisor — 2015–2021
   Placement: Tilburg University, Marketing
4. Davide Proserpio, PhD Student, Computer Science Dept., Co-advisor — 2012–2015
   Placement: USC Marshall, Marketing

Presentations and Invited Talks

Learning Market Structure & Consumer Preferences from Search Data: An Application to Hotel Demand Estimation

Conferences:
- Marketing Science 2019, Rome, Italy — 06/20/2019

Consumer Reviews and Regulation: Evidence from NY Restaurants

Academia:
- Technische Universität Berlin, Germany — 10/04/2021
- Universitat zu Koln, Germany — 07/31/2021
- Brandeis University, Walthman, MA — 04/07/2021
- Yale School of Management, New Haven, CT — 10/30/2020
- University of Miami, Miami, FL — 10/23/2020
- UMass Amherst Isenberg School of Management, Amherst, MA — 02/03/2018

Conferences:
- Marketing Science 2018, Philadelphia, PA — 06/14/2018

- BU Data Science Day, Boston University, Boston MA	01/26/2018
- Digital, Mobile Marketing, and Social Media Analytics Conference, NYU, New York, NY	09/12/2017
- Marketing Science, USC Marshall, Los Angeles, CA	06/10/2017
- Health Sector Data Blitz, Questom School of Business, Boston, MA	03/11/2017
- Marketing Analytics and Big Data conference, Columbia University, New York, NY	16/09/2017

The Welfare Impact of Consumer Reviews: A Case Study of the Hotel Industry

Academia:

- HEC, Paris, France	11/07/2019
- Duke Fuqua, Durham, North Carolina	05/01/2019
- Harvard Business School, Boston, MA	03/12/2019
- NYU Stern, New York, NY	02/14/2019
- Columbia GSB, New York, NY	10/16/2018
- USC Marshall, Los Angeles, CA	4/14/2017
- Stanford GSB, Palo Alto, CA	4/12/2017
- Michigan Ross, Ann Arbon, MI	4/10/2017
- University of Toronto Rotman, Toronto, ON	2/17/2017
- University of Chicago Booth, Chicago, IL	1/31/2017
- Wharton, Philadelphia, PA	1/25/2017
- MIT Economics Dept., Cambridge, MA	10/24/2016

Conferences:

- QME 2016, Kellogg School of Management, Evanston, IL	09/01/2016
- SCECR 2016, Naxos, Greece	06/24/2016
- Greater China Conference on Mobile Big Data Marketing, Hong Kong	06/13/2016
- Marketing Science 2016, Shanghai, China	06/16/2016

Online Reputation Management: Estimating the Impact of Management Responses on Consumer Reviews.

Academia:

- Havard EconCS Seminar, Cambridge, MA	10/02/2015
- Hebrew University, Computer Science dept., Jerusalem, Israel	06/14/2015

The Rise of the Sharing Economy: Estimating the Impact of Airbnb on the Hotel Industry

Conferences:

- Open & User Innovation Conference 2015, Harvard Business School, Boston MA	08/03/2016
- CODE@MIT, Cambridge MA	10/16/2015
- Marketing Science 2015, Baltimore	05/20/2015
- NYU 2015 Conference on Digital Big Data, Smart Life, Mobile Marketing Analytics	23/10/2015

Academia:

- Simon Business School, University of Rochester	2/29/2016

Industry:

- Microsoft Research New England	11/18/2015

Government:

- Cambridge City Council, Cambridge, MA 7/19/2016

Understanding Emerging Threats to Online Advertising

Academia:

- Goizueta Business School, Emory University 02/27/2015
- MSR/Harvard Game Theory Seminar 12/17/2014
- Questrom School of Business, MPPL Seminar 04/17/2015

Industry:

- Betaworks, NYC 07/23/2015

Fake It Till You Make It: Reputation, Competition, and Yelp Review Fraud

Conferences:

- Marketing Science 2014, Emory University, Atlanta 06/13/2014
- WIN 2013: The 5th Workshop on Information in Networks 10/04/2013
- DIMACS Workshop on Economic Aspects of Information Sharing 02/08/2013

Industry:

- Google, Palo Alto, CA 02/12/2013

The Groupon Effect on Yelp Ratings: A Root Cause Analysis

Conferences:

- Marketing Science 2013, Istanbul, Turkey 07/13/2013
- SCECR 2012, Montreal, Canada 06/29/2012
- ACM EC 2012, Valencia, Spain 06/05/2012
- Yale Customer Insights Conference, New Haven, CT 03/15/2013
- CAOSS 2012: Workshop on Computational and Online Social Science, New York, NY 10/12/2012

Academia:

- Wellesley University, Computer Science Dept 02/27/2012
- Northeastern University, Computer Science Dept 03/28/2012
- Harvard University, School of Eng. & Appl. Sci., Joint EconCS/Theory Seminar 04/16/2012
- Berkeley University, Computer Science Dept 04/10/2012

Industry:

- Microsoft Research New York 02/27/2013
- Google, Palo Alto, CA 04/09/2012
- Yelp, San Francisco, CA 04/11/2012

Daily Deals: Prediction, Social Diffusion, and Reputational Ramifications

Conferences:

- New York Computer Science and Economics Day (*Poster session.*) 09/16/2011
- Cambridge Area Economics and Computation Day (*Poster session.*) 11/18/2011
- ACM WSDM 2012 02/11/2012

Academia:
- Harvard University, School of Eng. & Appl. Sci., Joint EconCS/Theory Seminar 10/20/2011
- Boston University, Mathematics Dept., Statistics and Probability Seminar 11/17/2011
- Columbia University, Computer Science Dept., Seminar 12/08/2011

Industry:
- IBM Research, Hawthorne, NY, Seminar 12/07/2011
- Microsoft Research New England, Economics Research Working Group 10/14/2011

Information Asymmetries in Pay-Per-Bid Auctions: How Swoopo Makes Bank

Conferences:
- ACM EC 2010 06/09/2010

Academia:
- Boston University, Computer Science Dept., Theory Seminar 03/19/2010
- Harvard University, School of Eng. & Appl. Sci., Joint EconCS/Theory Seminar 03/29/2010
- Northeastern University, Coll. of Comp. & Inf. Sci., Graduate Student Seminar 04/03/2010
- Williams College, Computer Science Dept., Invited Colloquium 10/22/2010

Adaptive Weighing Designs for Keyword Value Computation

Conferences:
- ACM WSDM 2010 02/06/2010

Academia:
- Boston University, Computer Science Dept., Networking Reading Group 02/08/2010
- Boston University, Computer Science Dept., CS565 Data Mining, Guest Lecture 03/23/2010

Teaching

1. BA810: Supervised Machine Learning (44 students) Fall 2019
2. BA810: Supervised Machine Learning (42 students) Fall 2019
3. MK476: Machine Learning for Business Analytics (26 students) Spring 2019
4. MK824: Machine Learning for Business Analytics (44 students) Spring 2019
5. MK824: Machine Learning for Business Analytics (40 students) Spring 2018
6. MK824: Machine Learning for Business Analytics (43 students) Spring 2017
7. MK323: Marketing Management (49 students) Spring 2017
8. MK323: Marketing Management (48 students) Fall 2015
9. MK323: Marketing Management (50 students) Fall 2015
10. MK323: Marketing Management (47 students) Fall 2014
11. MK323: Marketing Management (47 students) Fall 2014
12. MK323: Marketing Management (49 students) Fall 2013
13. MK323: Marketing Management (50 students) Fall 2013

Course Development

MK476, **MK842**, and **BA810** are courses that I developed that introduce undergraduate, MBA, and MSBA students to machine learning methods with applications in business analytics.

Service

Editorial Review Board 2020–to-date
Marketing Science

Steering Committee Member 2019–to-date
Rafik B. Hariri Institute for Computing, Boston University

Editorial Review Board 2019–to-date
Journal of Marketing

Editorial Review Board 2019–to-date
Journal of Marketing Research

Associate Editor 2019–to date
ACM Transactions on Economics and Computation

Program committees: EC 2021 (Program Committee), EC 2020 (Senior Program Committee), WebConf 2020, EC 2019 (Senior Program Committee), EC 2018 (Senior Program Committee), EC 2018, WWW 2018, ICIS 2018, EC 2017 (Senior Program Committee), EC 2016 (Senior Program Committee), WWW 2016 (Senior Program Committee), ICIS 2016, SCECR 2016, EC 2015, WSDM 2015, WWW 2015, AMMA 2015, COBE 2015, EC 2014, WSDM 2014, WWW 2014, ICWSM 2014, WWW 2013, WSDM 2013, EC 2012.

Ad-hoc reviewer: Management Science, Marketing Science, Journal of Marketing Research, Information Systems Research, Games and Economic Behavior, Review of Industrial Organization, Operations Letters, Management Information Systems Quarterly, Journal of Public Economics, Manufacturing & Service Operations Management.

Media coverage

1. Some Smiling Faces in Online Customer Testimonials Are Stock Photos 05/16/2019
   The Wall Street Journal
2. Why ranting on Yelp is the wrong way to complain about awful service 04/03/2018
   The Boston Globe
3. Does a 'Sharing Economy' Foster Better Behavior? 03/27/2018
   PC Magazine
4. For Hotels, Online Reviews Really Matter to the Bottom Line 11/18/2016
   The Wall Street Journal
5. Don't Necessarily Judge Your Next E-Book By Its Online Review 10/26/2015
   NPR All Things Considered
6. Five-star fakes 10/24/2015
   The Economist

7. Ratings Now Cut Both Ways, So Don't Sass Your Uber Driver — 01/30/2015
   The New York Times
8. Airbnb, Uber, Lyft: de l'économie collaborative au business du partage — 08/16/2014
   Le nouvel Observateur
9. Airbnb versus hotels: Room for all, for now — 04/26/2014
   The Economist
10. Keeping crowdsourcing honest: can we trust the reviews? — 02/18/2014
    BBC News
11. Why It's So Hard to Figure Out the Sharing Economy's Winners and Losers — 02/10/2014
    The Atlantic Cities
12. Sharing Is Caring, Unless It Costs You Your Job — 02/05/2014
    The New York Times Bits Blog
13. Yelp Reviews: Can You Trust Them? — 11/04/2013
    BU Today
14. Fake reviews on Yelp?! Don't worry, we've got your back — 09/27/2013
    Yelp Official Blog
15. Yelp deems 20% of user reviews 'suspicious' — 09/24/2013
    Marketwatch, The Wall Street Journal
16. Yelp admits a quarter of submitted reviews could be fake — 09/13/2013
    BBC News
17. Underdog Businesses Are More Likely to Post Fake Yelp Reviews — 08/30/2013
    Harvard Business Review Blog Network
18. How Good Groupon Leads to Bad Yelp — 03/11/2013
    The Freaknomics Blog
19. For Some Businesses, Daily Deals Have A Dark Side — 07/06/2012
    NPR Morning Edition
20. Using Groupon Deals? Your Yelp Rating May Suffer — 04/11/2012
    The Huffington Post
21. Help for Yelp — 11/09/2011
    BU Today
22. Groupon IPO: An Internet star falls to Earth — 10/23/2011
    Christian Science Monitor
23. Is Groupon Bad For Business? — 10/18/2011
    WBUR
24. Groupon: Bad for Business? — 10/05/2011
    BU Today
25. Groupon's Morning After Problem — 10/04/2011
    Time Magazine

26. Coupon Sites Are a Great Deal, but Not Always to Merchants 10/02/2011
The New York Times
27. Groupon Deals May Hurt Your Yelp Ratings 09/12/2011
The Atlantic
28. Study: Daily Deals Hurt Businesses' Reputations 07/06/2011
The Wall Street Journal, "In Charge" blog
29. Groupon's Hidden Influence on Reputation 09/12/2011
The MIT Technology Review

APPENDIX B

LIST OF PRIOR EXPERT TESTIMONY FOR DR. GEORGIOS ZERVAS

Calhoun et al. v. Google LLC, ***U.S. District Court for the Northern District of California – San Jose Division*****, Case No. 5:20-cv-05146**

Expert Report (December 2021) and Deposition Testimony (January 2022).

Appendix C
Materials Considered

Legal Documents

Deposition of Justin Schuh, January 6, 2022.

Deposition of Michael Kleber, March 18, 2022.

Deposition of Ramin Halavati, January 18, 2022.

Deposition of Rory McClelland, February 18, 2022.

Expert Report of Dr. Georgios Zervas, April 15, 2022.

Expert Report of Jonathan E. Hochman, April 15, 2022.

Third Amended Class Action Complaint, Chasom Brown, et al., v. Google LLC, United States District Court Northern District of California, February 3, 2022.

Bates Stamped Document

GOOG-BRWN-00699213.

Academic Literature

Ahmad, Nadim, and Paul Schreyer, "Measuring GDP in a Digitalized Economy," *OECD Statistics Working Papers*, No. 2016/07, 2016, available at https://perma.cc/GNV6-GHRX.

Bekh, Alona, "Advertising-based Revenue Model in Digital Media Market," *Ekonomski vjesnik/Econviews - Review of Contemporary Business, Entrepreneurship and Economic Issues*, Vol. 33, No. 2, 2020, available at https://perma.cc/W7QP-YTPM.

Benzell, Seth G., Guillermo Lagarda, and Marshall Van Alstyne, "The Impact of APIs on Firm Performance," *Boston University Questrom School of Business Research Paper*, available at https://perma.cc/5FRY-WTSF.

Berman, Ron, and Ayelet Israeli, "The Value of Descriptive Analytics: Evidence from Online Retailers," *Harvard Business School*, Working Paper 21-067, 2021, available at https://perma.cc/B7JY-V3UX.

Brynjolfsson, Erik and Joo Hee Oh, "The Attention Economy: Measuring the Value of Free Digital Services on the Internet," *Thirty Third International Conference on Information Systems, Orlando 2012,* 2012, available at https://perma.cc/E2TZ-A6J9.

Garett, Renee et al., "A Literature Review: Website Design and User Engagement," *Online journal of communication and media technologies*, Vol. 6, No. 3, 2016, available at https://perma.cc/PPC7-PWCM.

Greenwood, Jeremy et al., "'You Will': A Macroeconomic Analysis of Digital Advertising," *Economics of Digital Services @ Penn*, 2021, available at https://perma.cc/ZX8P-9LC2.

Klym, Natalie and David Clark, "The Future of the Ad-Supported Internet Ecosystem," *MIT Internet Policy Research Initiative*, 2019, available at https://perma.cc/S6LC-KHPJ.

Nakamura, Leonard, Jon Samuels, and Rachel Soloveichik, "Valuing 'Free' Media in GDP: An Experiment Approach," *Federal Reserve Board of Philadelphia Working Paper*, No. 16-24, 2016, available at https://perma.cc/4HMJ-7D3R.

Pearce, Joshua, M., "Energy Conservation with Open Source Ad Blockers," *MDPI,* Vol. 8, No. 2, 2020, available at https://perma.cc/USH9-AQ8F.

Schneier, Bruce, "Data and Goliath: The Hidden Battles to Collect Your Data and Control Your World," W.W. Norton & Company, 2015.

Tidal, Junior R., "Using Web Analytics for Mobile Interface Development," *New York City College of Technology*, 2013, available at https://perma.cc/Z6Z8-U5MW.

Publicly Available Sources

"About enhanced conversions," *Google Ads Help*, *Google*, available at https://perma.cc/6UH8-9Q7X.

"About publisher provided identifiers," *Ad Manager Help*, *Google*, available at https://perma.cc/P6WG-YX4S.

"About Us: Helping your business leverage the Internet," *Hochman Consultants*, available at https://perma.cc/86E7-A39K.

"Ad-Supported Internet Brings over $1 Trillion to the U.S. Economy, Representing 6 Percent of Country's Total GDP, According to IAB Study Led by Harvard Business School Professor," *Interactive Advertising Bureau*, March 15, 2017, available at https://perma.cc/G9BS-85MJ.

"Ad-Supported vs Subscription: Which is Better," *Aniview*, December 11, 2021, available at https://perma.cc/7NN2-XFEY.

"Analytics Anywhere in the Customer Journey," *Adobe Analytics*, *Adobe*, available at https://perma.cc/6DYL-5AH4.

"Analyze the customer journey across websites and apps," *PIWIK PRO,* available at https://perma.cc/7MRA-9CBF.

"Apple Privacy Policy," *Apple Privacy*, *Apple*, October 27, 2021, available at https://perma.cc/839B-PPM5.

"Build Better Products," *Mixpanel*, available at https://perma.cc/7AV6-ZBHZ.

"BuzzFeed's Privacy Policy and Cookie Policy," *BuzzFeed*, October 8, 2021, available at https://perma.cc/4WBC-XSC9.

"Choose a Plan," *Peacock*, available at https://perma.cc/MLK5-GX59.

"Chrome DevTools," *Chrome Developers, Google,* available at https://perma.cc/9T24-5L9C.

"Cookie Notice," *Reddit*, September 15, 2020, available at https://perma.cc/M3WH-HDL9.

"Cookie Policy," *Indeed, Inc.*, November 1, 2021, available at https://perma.cc/C6JR-WU5N.

"Cookie Policy," *Gannett*, October 5, 2020, available at https://perma.cc/TRQ5-GSPU.

"Cookie Policy," *Grammarly*, December 30, 2019, available at https://perma.cc/V5MQ-G8B9.

"Cookie Policy," *LinkedIn*, June 3, 2022, available at https://perma.cc/K9RY-V8AE.

"Cookie Policy," *The New York Times*, September 17, 2021, available at https://perma.cc/LN7U-H4Q3.

"Cookies Policy," *Insider Inc.,* September 4, 2019, available at https://perma.cc/MH9H-5V3Z.

"Cookies, web beacons, and similar technology ("Cookie Notice")," *eBay Customer Service*, *eBay*, available at https://perma.cc/5FMF-UC3J.

"cp command in Linux with examples," *GeeksforGeeks*, February 19, 2021, available at https://perma.cc/2TV6-H3DY.

"Definition of User Agent," *W3C*, June 16, 2011, available at https://perma.cc/5FCX-K45N.

"Disable Google Analytics measurement," *Google Analytics*, *Google*, available at https://perma.cc/FXP9-3CGT.

"Encyclopaedia Britannica, Inc. Privacy Notice," *Encyclopedia Britannica*, November 10, 2021, available at https://perma.cc/57Z7-EHZ5.

"Google Analytics alternative that protects your data and your customers' privacy," *Matomo*, available at https://perma.cc/2FG3-BHM7.

"Google Analytics Blocker," *Firefox Browser Add-Ons*, available at https://perma.cc/L3RX-X2A6.

"Google Chrome Privacy Notice," *Google*, September 23, 2021, available at https://perma.cc/SX4Q-3YU4.

"Google Chrome," *The Keyword*, *Google*, available at https://perma.cc/5QFA-CBFC.

"Google Privacy Policy," *Google Privacy & Terms*, *Google,* available at https://perma.cc/LYU9-8XTC.

"Google Publisher Policies: Privacy-related policies: Privacy disclosures," *Google Ad Manager Help*, *Google*, available at https://perma.cc/G2FU-Z7PK.

"Hearst.com Privacy Notice," *Hearst Communications*, December 30, 2019, available at https://perma.cc/6SKE-3CK7.

"How Chrome Incognito keeps your browsing private," *Google Chrome Help, Google*, available at https://perma.cc/2YZX-VG2U.

"HTML <script> Tag," *W3Schools*, available at https://perma.cc/KH7P-MY7D.

"HTTP headers | User-Agent," *GeeksforGeeks*, October 11, 2019, available at https://perma.cc/QAA8-S428.

"Indeed's Full Privacy Policy," *Indeed Inc.*, May 27, 2022, available at https://perma.cc/HBC7-YGSK.

"Inspect network activity," *Chrome Developers, Google*, February 8, 2019, available at https://perma.cc/96JX-HTQF.

"Kohl's Department Stores, Inc. — About Our Ads," *Kohl's Department Stores, Inc.*, August 12, 2016, available at https://perma.cc/AU59-FHTK.

"KOHL'S PRIVACY POLICY - YOUR PRIVACY RIGHTS," *Kohl's Department Stores, Inc.*, April 13, 2022, available at https://perma.cc/TUB7-WLPN.

"Limited Ads," *Google Ad Manager Help*, *Google*, available at https://perma.cc/MT25-D2C3.

"Limits of User-ID view & Cross Device reports," *Analytics Help, Google*, available at https://perma.cc/BAM5-AYUB.

"Manage user privacy," *Google Analytics*, *Google*, available at https://perma.cc/PVW7-EBB2.

"Measurement Protocol, SKD, and User ID Feature Policy," *Google Analytics*, *Google*, available at https://perma.cc/88W2-LDYD.

"Policy on Cookies, Web Beacons, Pixels, and Similar Technologies," *AccuWeather*, May 25, 2019, available at https://perma.cc/EJ4S-M8EJ.

"Privacy & Cookies Policy (the "Policy")," *Associated Newspapers Ltd*, March 10, 2022, available at https://perma.cc/R3WW-44FY.

"Privacy & Cookies Policy," *Chaturbate*, May 25, 2022, available at https://perma.cc/WN3X-ZS9J.

"Privacy Notice," *Hearst Television Inc.*, June 2020, available at https://perma.cc/84RP-6H7H.

"Privacy Notice," *Momentive*, August 16, 2021, available at https://perma.cc/J5FX-6XPL.

"Privacy Notice," *New York Post*, January 20, 2022, available at https://perma.cc/NG69-7CFQ.

"Privacy Notice," *Realtor.com*, December 7, 2021, available at https://perma.cc/QQ66-TJJA.

"Privacy Policy and Cookie Statement," *Condé Nast*, February 18, 2022, available at https://perma.cc/QN2J-686R.

"Privacy Policy," *AccuWeather*, August 21, 2020, available at https://perma.cc/4NT5-WCHW.

"Privacy Policy," *Change.org*, March 25, 2022, available at https://perma.cc/G2HG-5AEV.

"Privacy Policy," *Chess.com*, April 21, 2022, available at https://perma.cc/J4R2-JDBM.

"Privacy Policy," *Fandom, Inc.*, May 24, 2022, available at https://perma.cc/8PRV-RMMT.

"Privacy Policy," *Fox News Network, LLC*, November 10, 2021, available at https://perma.cc/5C3E-C62W.

"Privacy Policy," *LinkedIn*, August 11, 2020, available at https://perma.cc/2TT8-37Q2.

"Privacy Policy," *Nexstar Media Group Inc.*, December 31, 2019, available at https://perma.cc/8T7E-MAKP.

"Privacy Policy," *Paramount*, March 10, 2021, available at https://perma.cc/7Y87-LL46.

"Privacy Policy," *Pornhub*, April 14, 2022, available at https://perma.cc/2VZY-KJ6A.

"Privacy Policy," *Privy*, December 20, 2019, available at https://perma.cc/A8HS-5M6E.

"Privacy Policy," *Publishers Clearing House*, May 21, 2021, available at https://perma.cc/RU2Q-5JVK.

"Privacy Policy," *The New York Times*, February 3, 2022, available at https://perma.cc/3FUW-2XYP.

"Privacy Policy," *The Washington Post*, October 5, 2021, available at https://perma.cc/5WVW-YRQV.

"Privacy Policy," *The Weather Company*, available at https://perma.cc/H6XL-5KM3.

"Privacy Policy," *Worldometers.info*, available at https://perma.cc/TP5H-BSNH.

"Privacy Policy," *Zynga*, May 31, 2022, available at https://perma.cc/EHW7-G4J6.

"Private Browsing - Use Firefox without saving history," *Mozilla Support,* available at https://perma.cc/X9NG-QCB8.

"Protecting your privacy online," *The Privacy Sandbox*, *Google*, available at https://perma.cc/C2TM-927B.

"Quizlet Ad and Cookie Policy," *Quizlet*, January 1, 2020, available at https://perma.cc/UQ3J-8QX4.

"Quizlet Privacy Policy," *Quizlet*, August 17, 2021, available at https://perma.cc/Z7ZY-YKFS.

"Roblox Privacy and Cookie Policy," *Roblox*, June 3, 2022, available at https://perma.cc/2EXQ-5Q3Q.

"Set up enhanced conversions for web manually with Google Tag Manager", *Google Ads Help, Google,* available at https://perma.cc/CR99-8WUE.

"Share of digital in newspaper advertising revenue in the United States from 2011 to 2020," *Statista*, available at https://perma.cc/P88K-7CQK.

"Statement on Cookies and Tracking Technologies," *PayPal*, May 25, 2018, available at https://perma.cc/2PZR-8P87.

"Strategies for carrying out testing," *MDN Web Docs*, available at https://perma.cc/F5G6-KN2C.

"Target Privacy Policy," *Target*, July 1, 2021, available at https://perma.cc/38A3-CJZ7.

"The Internet Marketing Process," *Hochman Consultants*, available at https://perma.cc/Y354-MANZ.

"The New York Times Company Reports First-Quarter 2022 Results," *The New York Times Company*, May 4, 2022, available at https://perma.cc/QR4R-EHP6.

"The Video Host with the Most," *Wistia,* available at https://perma.cc/BR2B-UZ9W.

"Three Ways APIs Are Keeping Small Businesses Digitally Competitive," *Small Business Trends,* February 10, 2022, available at https://perma.cc/6W7V-ZR5N.

"TownNews Privacy Statement," *TownNews*, June 30, 2020, available at https://perma.cc/S2NP-6YRS.

"Understand how users behave on your site, what they need, and how they feel, fast," *Hotjar*, available at https://perma.cc/PFP2-TD6F.

"User-ID limits," *Analytics Help, Google,* available at https://perma.cc/V6BT-9A8X.

"VDO.AI Terms and Conditions," *VDO.AI*, available at https://perma.cc/M6RL-2ZKH.

"W3C TAG Observations on Private Browsing Modes," *World Wide Web Consortium*, April 9, 2020, available at https://perma.cc/8SLY-NZ66.

"WarnerMedia News and Sports Privacy Policy," *WarnerMedia*, April 8, 2022, available at https://perma.cc/U3PC-YX2X.

"WebMD Cookie Policy," *WebMD*, April 28, 2022, available at https://perma.cc/ED44-6Z33.

"What are browser developer tools?" *MDN Web Docs*, available at https://perma.cc/SL8Y-WSFP.

"Without our members, there is no LinkedIn.," *LinkedIn*, available at https://perma.cc/3W7E-HA7Y.

"Yummly Privacy Notice & Your Privacy," *Yummly*, December 2021, available at https://perma.cc/L2H5-MHSD.

Benton, Joshua, "Your favorite way to get around The New York Times paywall might be about to go away," *NiemanLab*, February 28, 2019, available at https://perma.cc/F5ED-BV3H.

Bradshaw, Kyle, "Google wants to make it harder for sites to detect that you're using Chrome's Incognito Mode," *9to5Google*, February 15, 2019, available at https://perma.cc/QSX5-J6RV.

Deighton, John, A., and Leora D. Kornfeld, "Economic Value of the Advertising-Supported Internet Ecosystem," *Interactive Advertising Bureau,* September 2012, available at https://perma.cc/2SS5-CGJK.

Orgera, Scott, "How to Disable JavaScript in Firefox," *Lifewire*, December 2, 2020, available at https://perma.cc/5GLL-U868.

Sabanovic, Edin, "How to Use Google Analytics to Improve Your Web Design Projects," *Shopify Partners*, *Shopify*, June 13, 2017, available at https://perma.cc/QG8Y-JYD8.

Zacks Equity Research, "Subscription Revenues a Key Driver for NY Times (NYT) in 2022," *Yahoo*, December 21, 2021, available at https://perma.cc/BGY8-EHW7.

Appendix D

Privacy Policy Screenshots

I reviewed the top 25 websites for Google Analytics and Google Ad Manager referred to by Mr. Hochman.[1] Except for few instances where a website was not accessible or the privacy policy was not applicable,[2] all websites contained a privacy notice page which was accessible in Private Browsing Mode in Chrome, Edge, and Safari, as illustrated in Figures below for all the examples I discuss in **Section IV.A** of my report.[3,4]

---

1 See e.g., Hochman Report, ¶ 134.

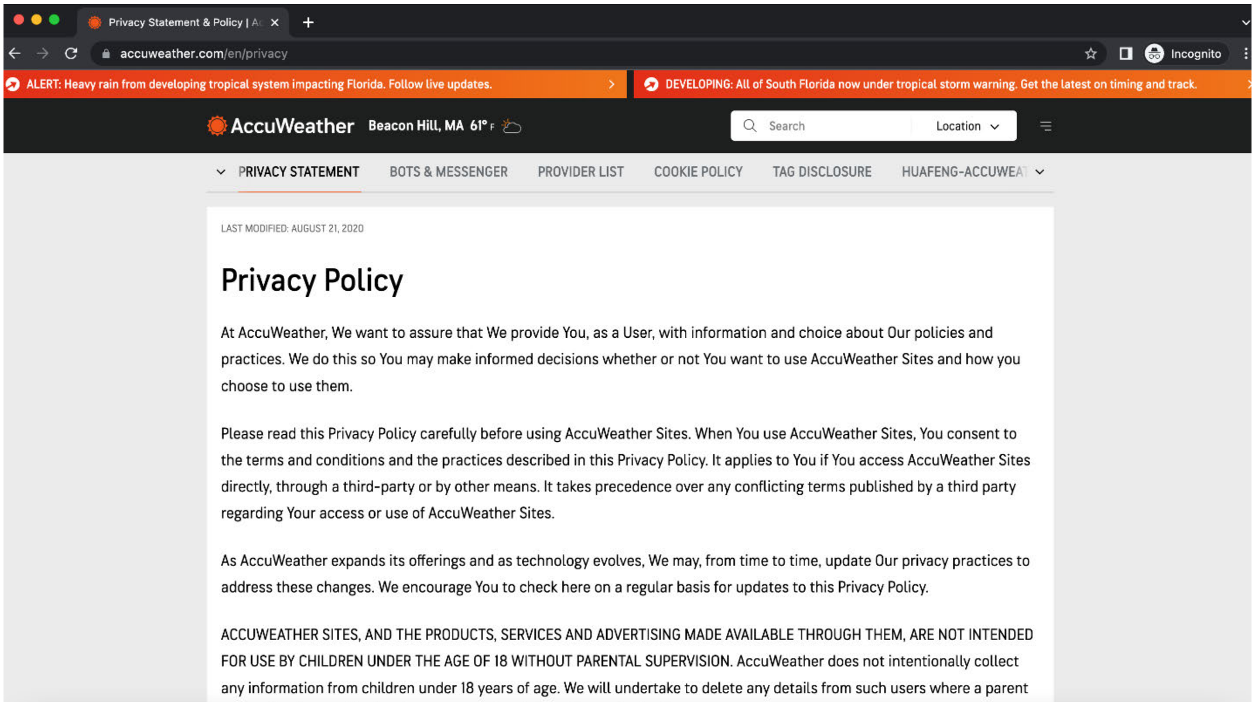
2 For example, *https://howto.gov/* was not accessible; *https://wikia.com/* redirected to *https://fandom.com/* which contained privacy notices; *https://condenastinternational.com/* redirected to *https://condenast.com/* which contained privacy notices; certain websites included in the list are duplicated to another website in the list. For examples, *https://mobile.nytimes.com/* is a duplicate to *https://nytimes.com/*. Both have a common privacy notices webpage *https://www.nytimes.com/privacy/privacy-policy/*.

3 I use macOS since the current version of Safari cannot be used on Windows, but the current versions of Chrome, Edge, and Safari can be used on macOS.

4 The full review of all accessible websites referred to by Mr. Hochman is included in my backup production.

Figure D.1.1

AccuWeather.com - Chrome



LAST MODIFIED: AUGUST 21, 2020

Privacy Policy

At AccuWeather, We want to assure that We provide You, as a User, with information and choice about Our policies and practices. We do this so You may make informed decisions whether or not You want to use AccuWeather Sites and how you choose to use them.

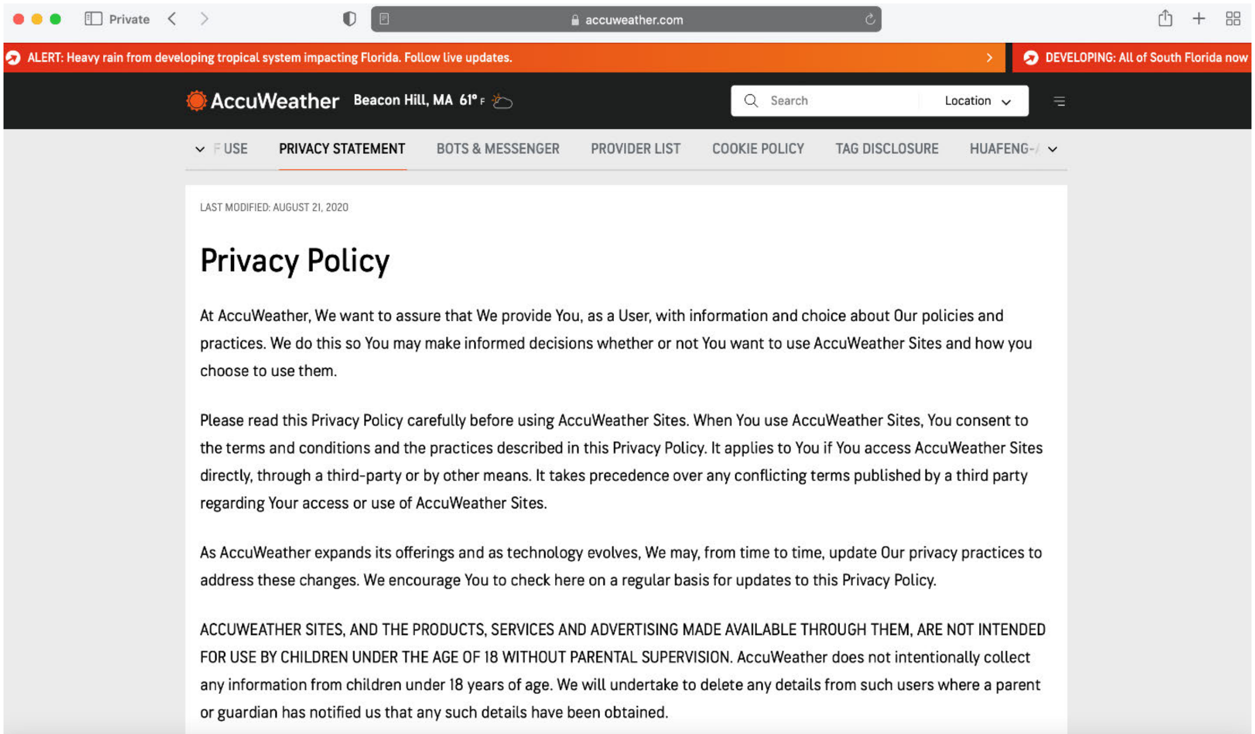
Please read this Privacy Policy carefully before using AccuWeather Sites. When You use AccuWeather Sites, You consent to the terms and conditions and the practices described in this Privacy Policy. It applies to You if You access AccuWeather Sites directly, through a third-party or by other means. It takes precedence over any conflicting terms published by a third party regarding Your access or use of AccuWeather Sites.

As AccuWeather expands its offerings and as technology evolves, We may, from time to time, update Our privacy practices to address these changes. We encourage You to check here on a regular basis for updates to this Privacy Policy.

ACCUWEATHER SITES, AND THE PRODUCTS, SERVICES AND ADVERTISING MADE AVAILABLE THROUGH THEM, ARE NOT INTENDED FOR USE BY CHILDREN UNDER THE AGE OF 18 WITHOUT PARENTAL SUPERVISION. AccuWeather does not intentionally collect any information from children under 18 years of age. We will undertake to delete any details from such users where a parent

Figure D.1.2

AccuWeather.com - Safari



Privacy Policy

At AccuWeather, We want to assure that We provide You, as a User, with information and choice about Our policies and practices. We do this so You may make informed decisions whether or not You want to use AccuWeather Sites and how you choose to use them.

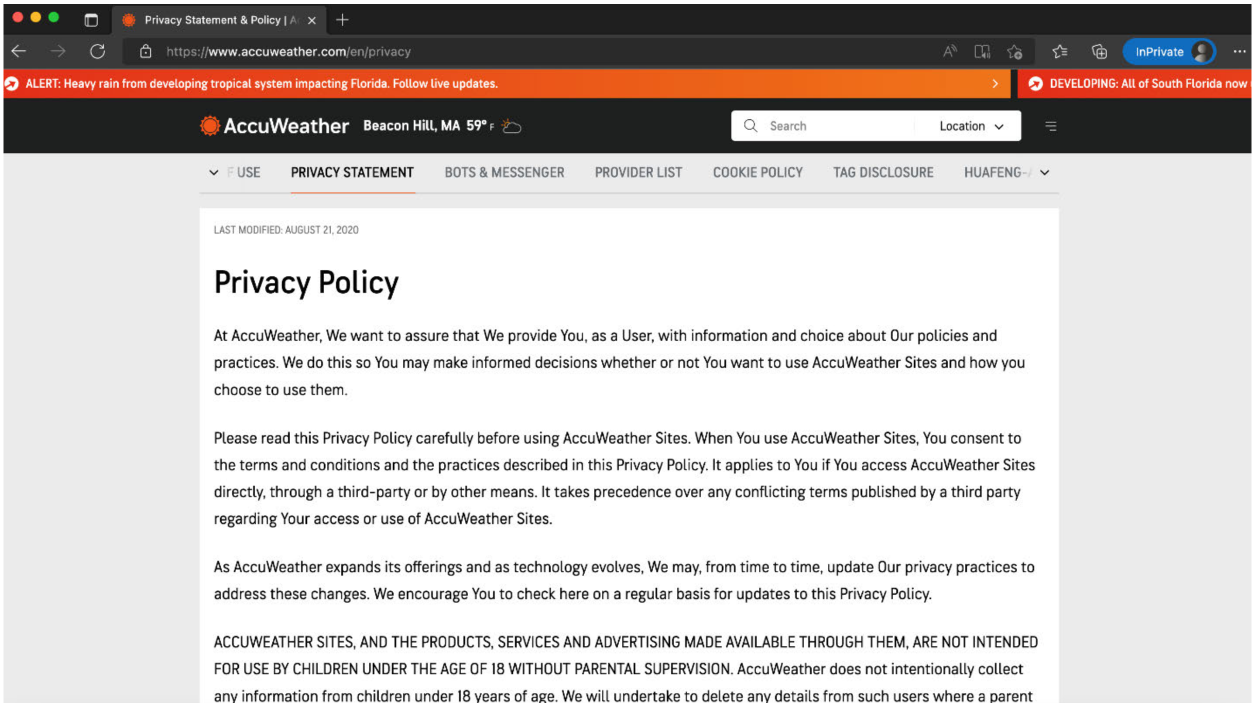
Please read this Privacy Policy carefully before using AccuWeather Sites. When You use AccuWeather Sites, You consent to the terms and conditions and the practices described in this Privacy Policy. It applies to You if You access AccuWeather Sites directly, through a third-party or by other means. It takes precedence over any conflicting terms published by a third party regarding Your access or use of AccuWeather Sites.

As AccuWeather expands its offerings and as technology evolves, We may, from time to time, update Our privacy practices to address these changes. We encourage You to check here on a regular basis for updates to this Privacy Policy.

ACCUWEATHER SITES, AND THE PRODUCTS, SERVICES AND ADVERTISING MADE AVAILABLE THROUGH THEM, ARE NOT INTENDED FOR USE BY CHILDREN UNDER THE AGE OF 18 WITHOUT PARENTAL SUPERVISION. AccuWeather does not intentionally collect any information from children under 18 years of age. We will undertake to delete any details from such users where a parent or guardian has notified us that any such details have been obtained.

Figure D.1.3

AccuWeather.com - Edge



CONFIDENTIAL – SUBJECT TO PROTECTIVE ORDER

Figure D.2.1

Change.org - Chrome

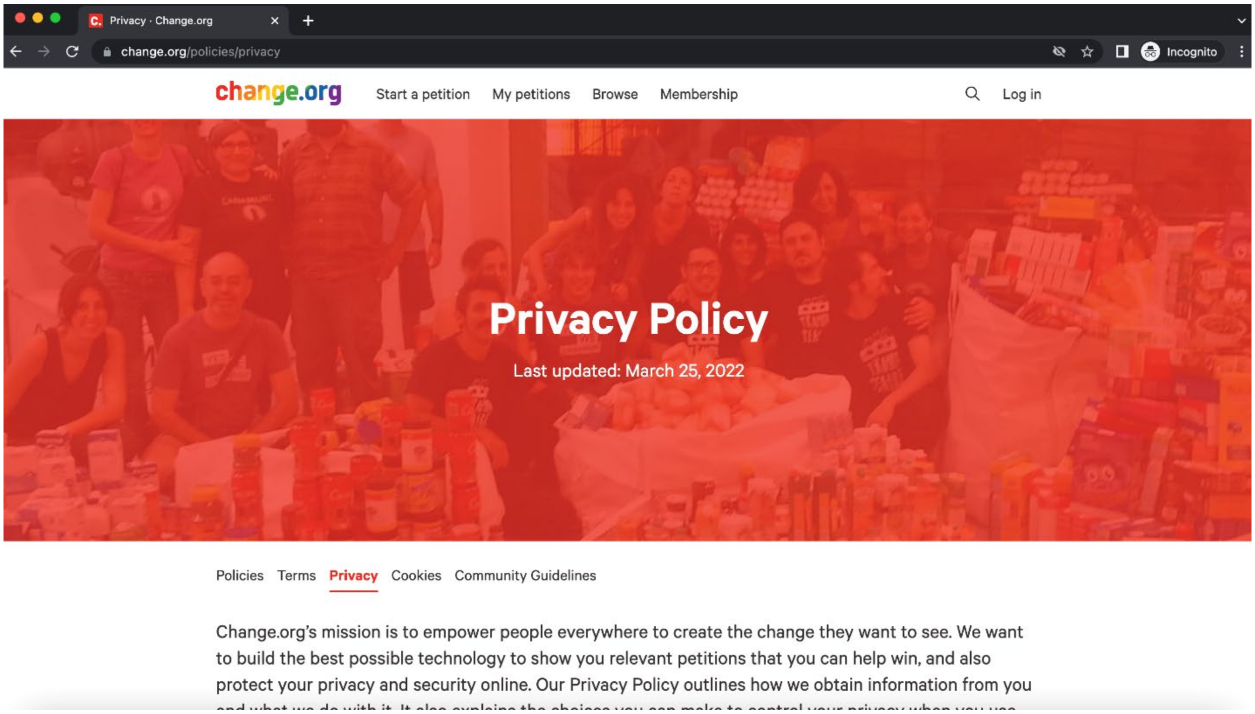
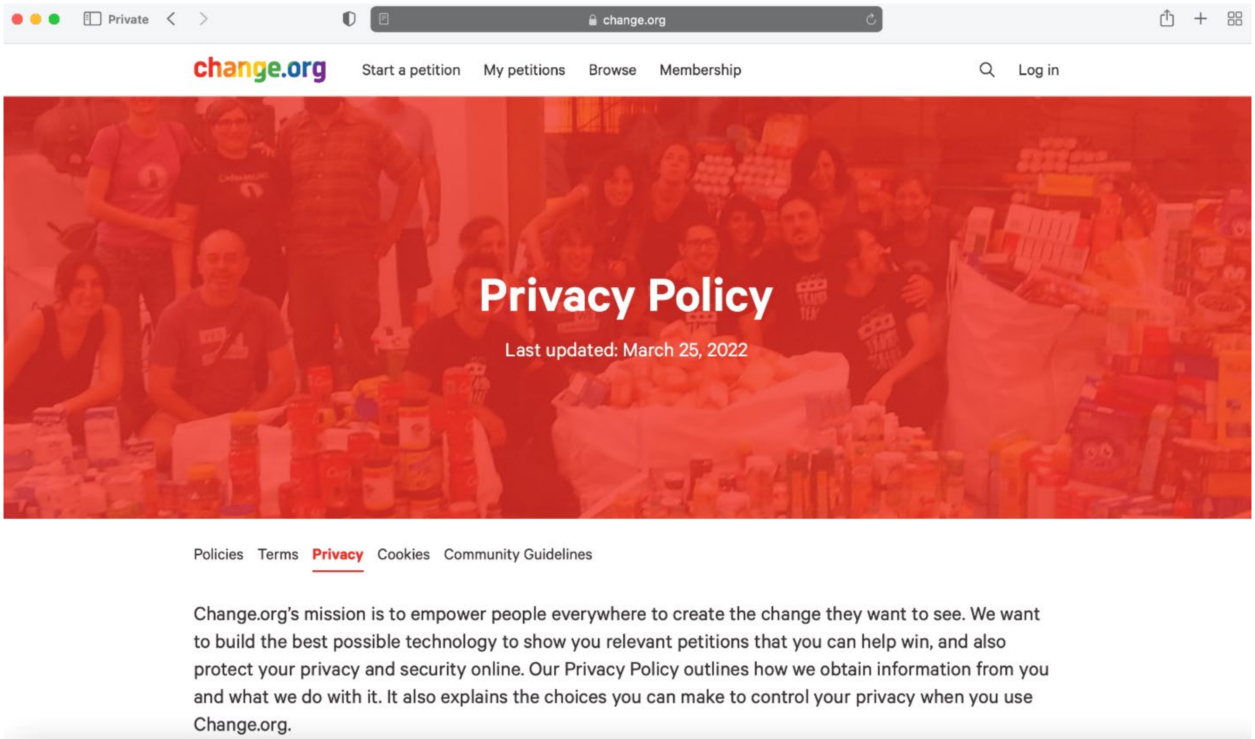


Figure D.2.2

Change.org - Safari



CONFIDENTIAL – SUBJECT TO PROTECTIVE ORDER

Figure D.2.3

Change.org - Edge

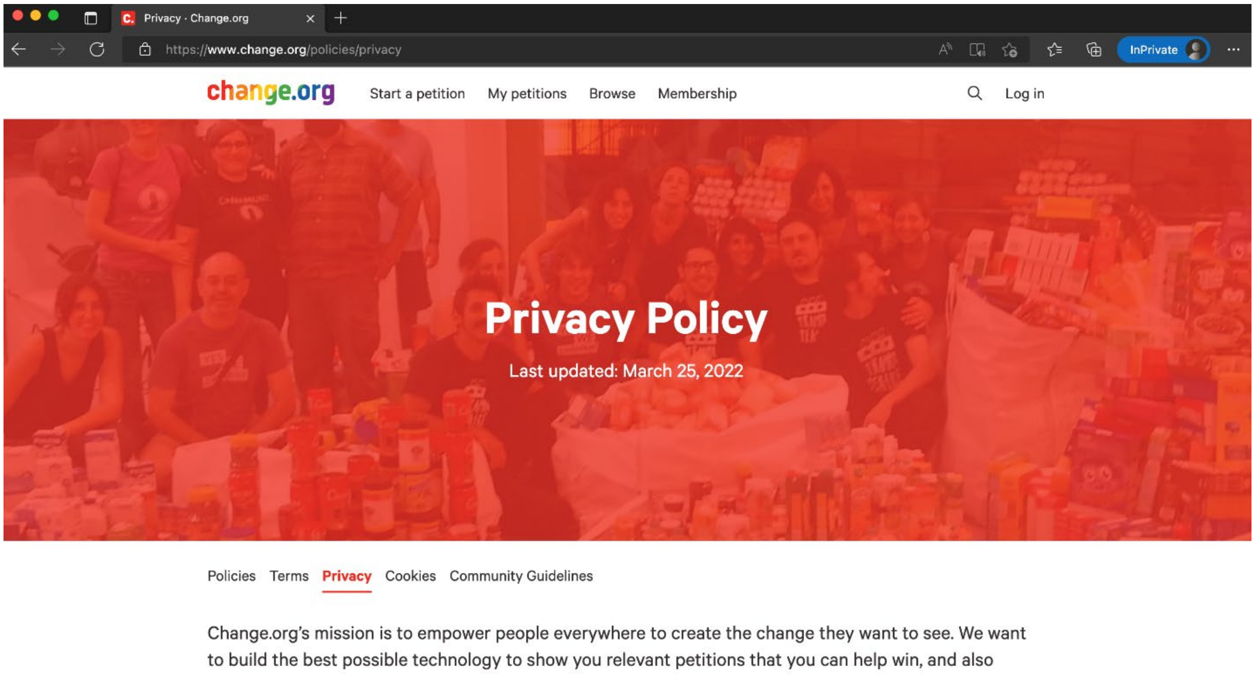
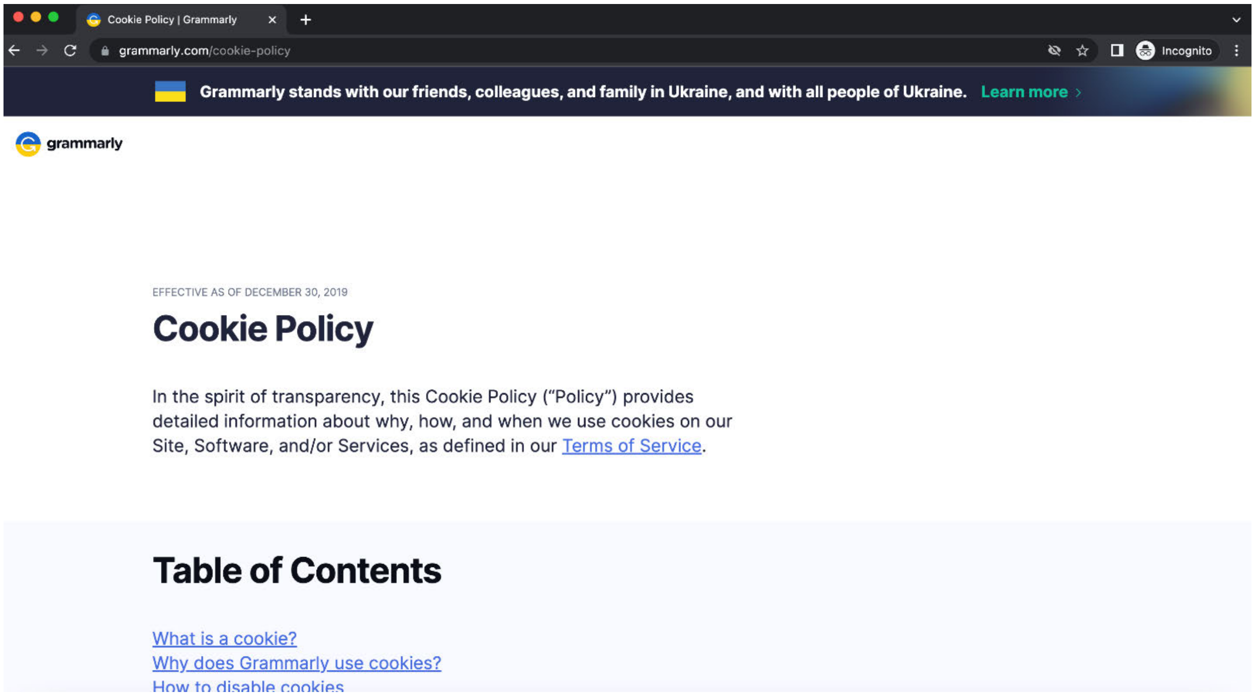


Figure D.3.1

Grammarly.com - Chrome



Cookie Policy | Grammarly

grammarly.com/cookie-policy

Incognito

Grammarly stands with our friends, colleagues, and family in Ukraine, and with all people of Ukraine. Learn more ›

grammarly

EFFECTIVE AS OF DECEMBER 30, 2019

Cookie Policy

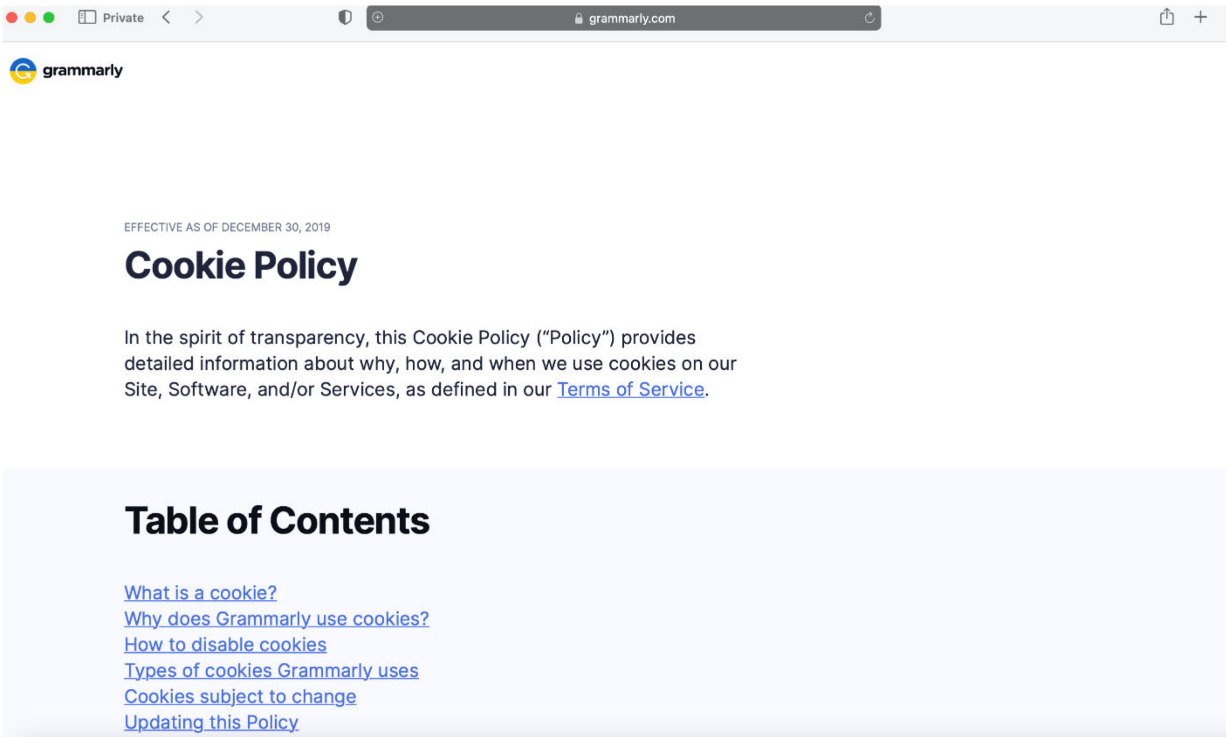
In the spirit of transparency, this Cookie Policy ("Policy") provides detailed information about why, how, and when we use cookies on our Site, Software, and/or Services, as defined in our Terms of Service.

Table of Contents

CONFIDENTIAL – SUBJECT TO PROTECTIVE ORDER

Figure D.3.2

Grammarly.com - Safari



EFFECTIVE AS OF DECEMBER 30, 2019

Cookie Policy

In the spirit of transparency, this Cookie Policy ("Policy") provides detailed information about why, how, and when we use cookies on our Site, Software, and/or Services, as defined in our Terms of Service.

Table of Contents

Figure D.3.3

Grammarly.com - Edge

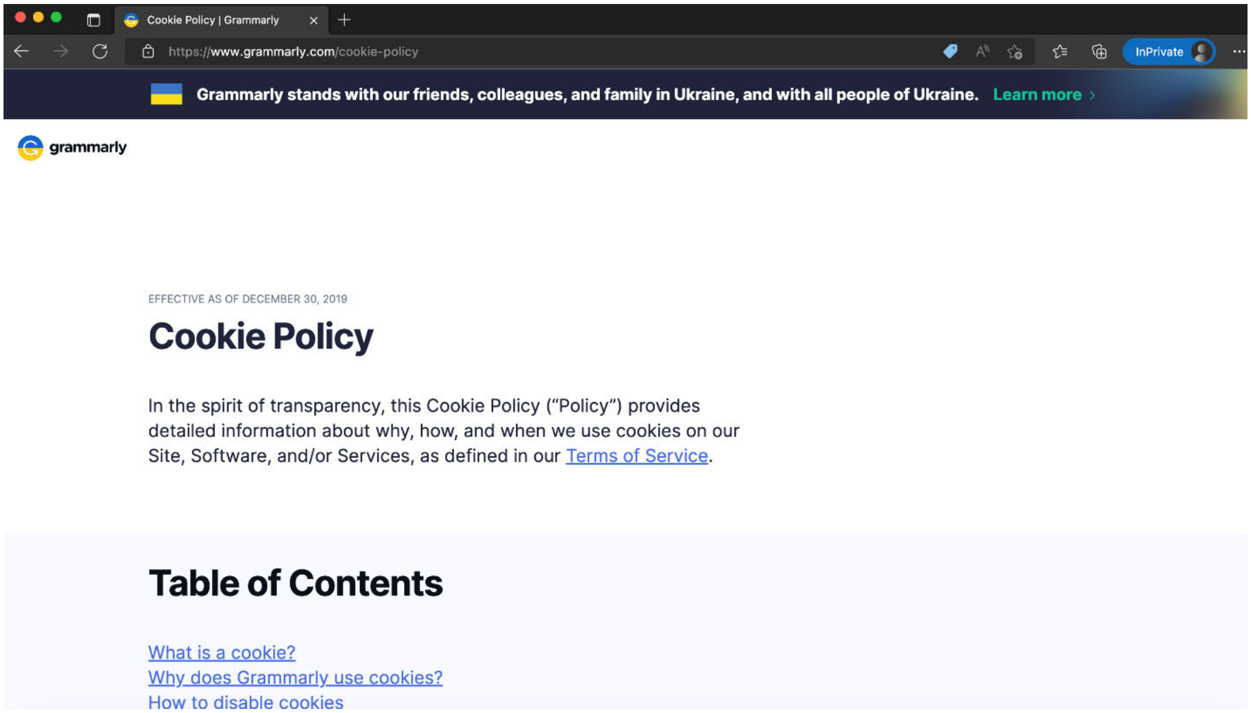
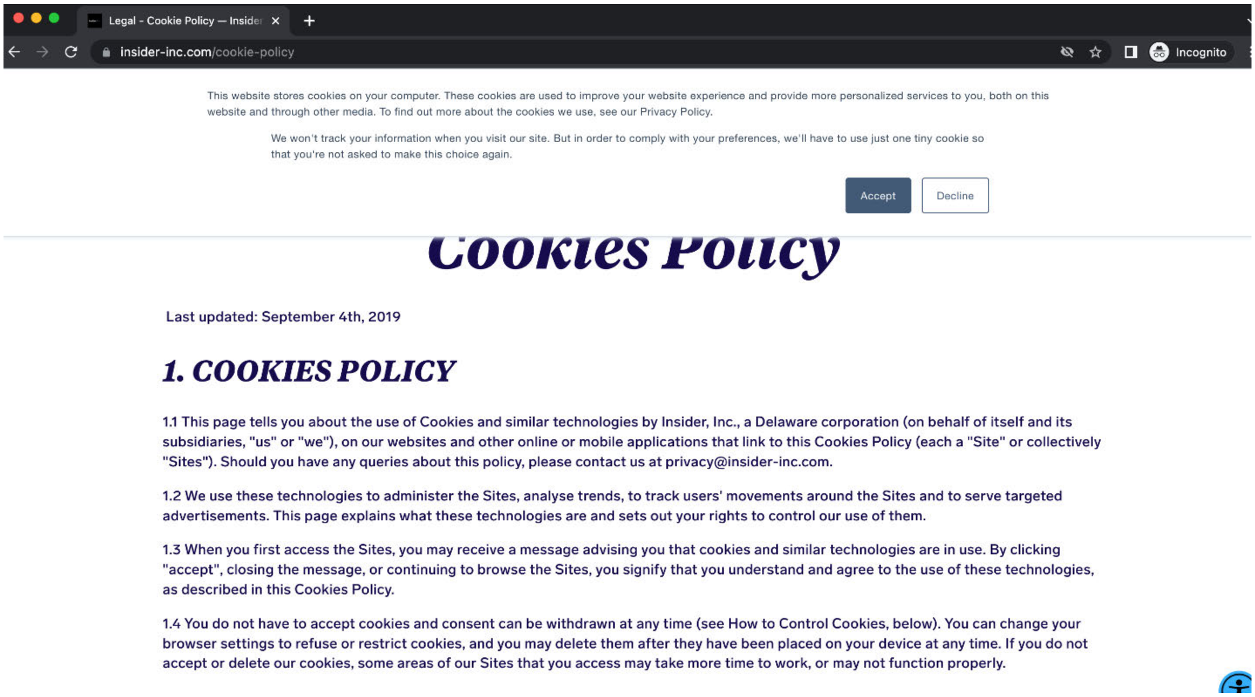


Figure D.4.1

Insider-Inc.com - Chrome[5]


Legal - Cookie Policy — Insider

insider-inc.com/cookie-policy

Incognito

This website stores cookies on your computer. These cookies are used to improve your website experience and provide more personalized services to you, both on this website and through other media. To find out more about the cookies we use, see our Privacy Policy.

We won't track your information when you visit our site. But in order to comply with your preferences, we'll have to use just one tiny cookie so that you're not asked to make this choice again.

Accept Decline

Cookies Policy

Last updated: September 4th, 2019

1. COOKIES POLICY

1.1 This page tells you about the use of Cookies and similar technologies by Insider, Inc., a Delaware corporation (on behalf of itself and its subsidiaries, "us" or "we"), on our websites and other online or mobile applications that link to this Cookies Policy (each a "Site" or collectively "Sites"). Should you have any queries about this policy, please contact us at privacy@insider-inc.com.

1.2 We use these technologies to administer the Sites, analyse trends, to track users' movements around the Sites and to serve targeted advertisements. This page explains what these technologies are and sets out your rights to control our use of them.

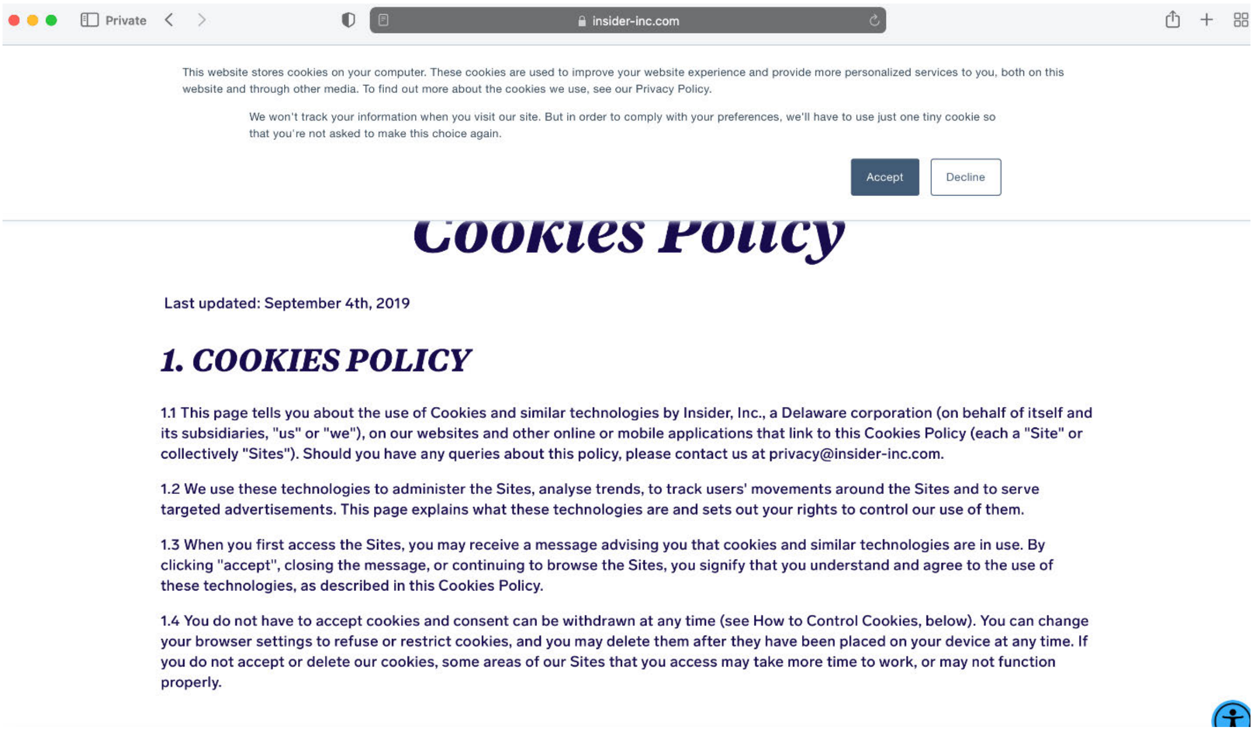
1.3 When you first access the Sites, you may receive a message advising you that cookies and similar technologies are in use. By clicking "accept", closing the message, or continuing to browse the Sites, you signify that you understand and agree to the use of these technologies, as described in this Cookies Policy.

1.4 You do not have to accept cookies and consent can be withdrawn at any time (see How to Control Cookies, below). You can change your browser settings to refuse or restrict cookies, and you may delete them after they have been placed on your device at any time. If you do not accept or delete our cookies, some areas of our Sites that you access may take more time to work, or may not function properly.

5 *Insider, Inc.* is the owner of the *businessinsider.com* website.

Figure D.4.2

Insider-Inc.com - Safari[6]

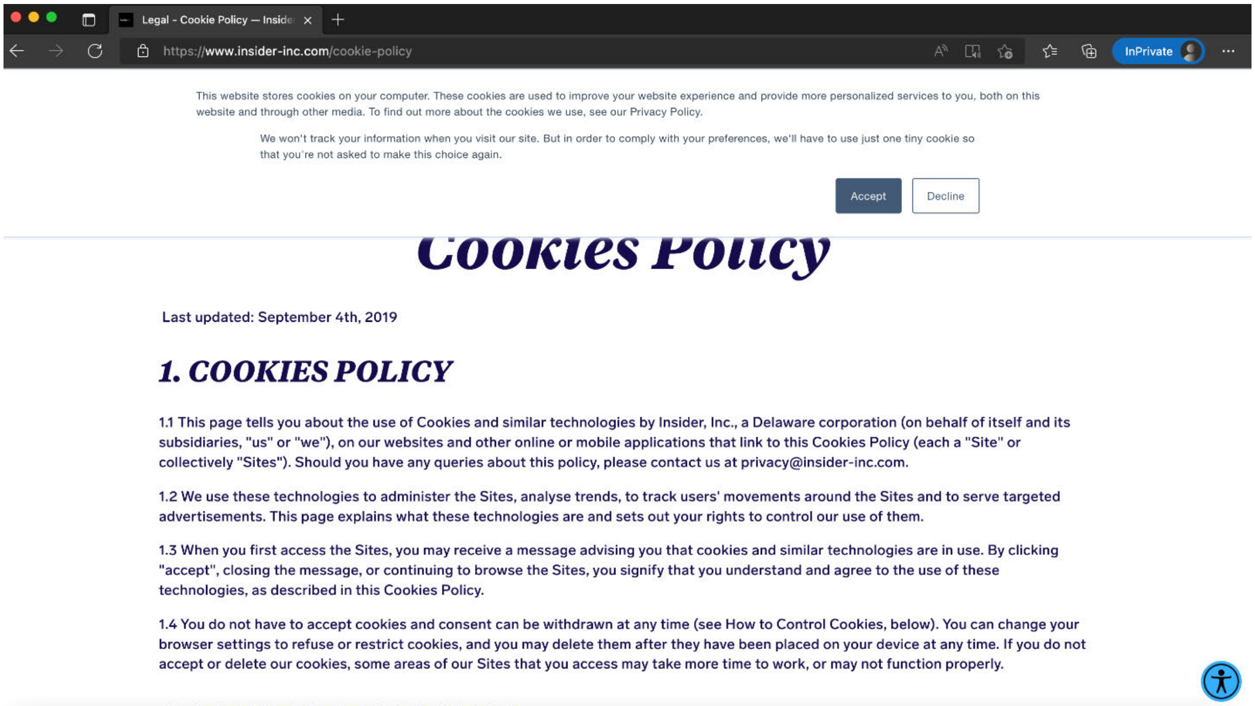


6 *Insider, Inc.* is the owner of the *businessinsider.com* website.

CONFIDENTIAL – SUBJECT TO PROTECTIVE ORDER

Figure D.4.3

Insider-Inc.com - Edge[7]


Legal - Cookie Policy — Inside
https://www.insider-inc.com/cookie-policy
InPrivate

This website stores cookies on your computer. These cookies are used to improve your website experience and provide more personalized services to you, both on this website and through other media. To find out more about the cookies we use, see our Privacy Policy.

We won't track your information when you visit our site. But in order to comply with your preferences, we'll have to use just one tiny cookie so that you're not asked to make this choice again.

Accept Decline

Cookies Policy

Last updated: September 4th, 2019

1. COOKIES POLICY

1.1 This page tells you about the use of Cookies and similar technologies by Insider, Inc., a Delaware corporation (on behalf of itself and its subsidiaries, "us" or "we"), on our websites and other online or mobile applications that link to this Cookies Policy (each a "Site" or collectively "Sites"). Should you have any queries about this policy, please contact us at privacy@insider-inc.com.

1.2 We use these technologies to administer the Sites, analyse trends, to track users' movements around the Sites and to serve targeted advertisements. This page explains what these technologies are and sets out your rights to control our use of them.

1.3 When you first access the Sites, you may receive a message advising you that cookies and similar technologies are in use. By clicking "accept", closing the message, or continuing to browse the Sites, you signify that you understand and agree to the use of these technologies, as described in this Cookies Policy.

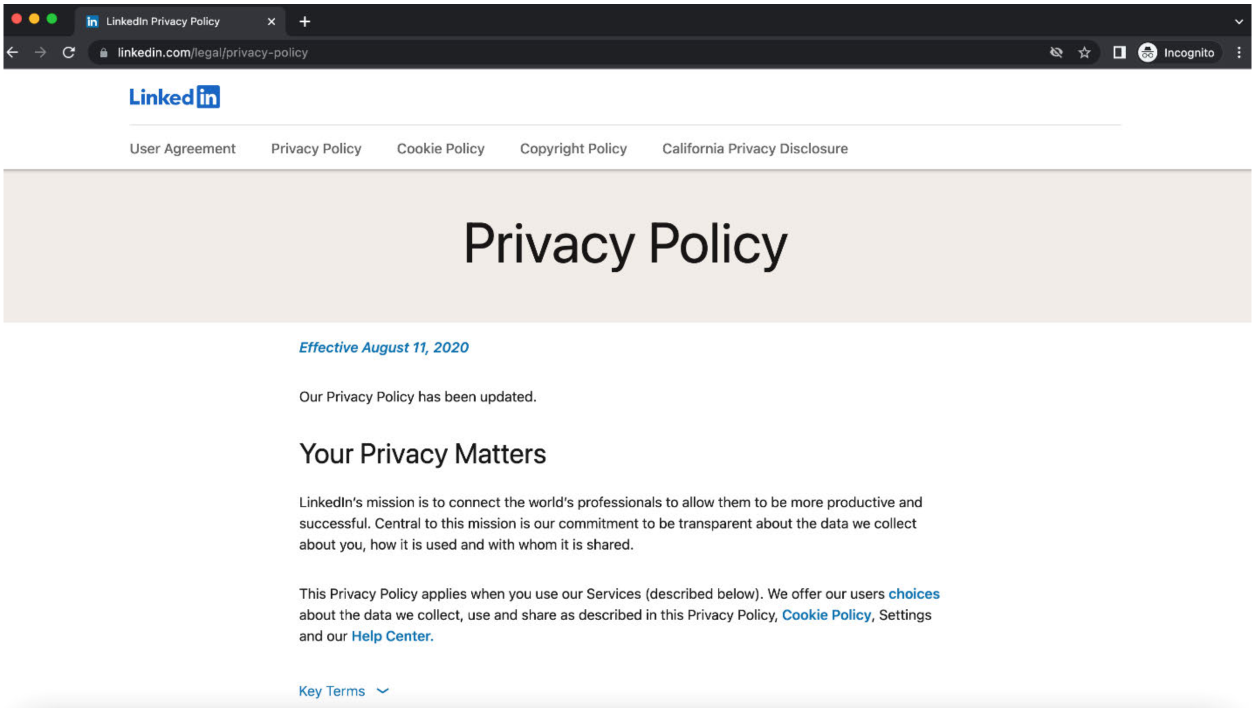
1.4 You do not have to accept cookies and consent can be withdrawn at any time (see How to Control Cookies, below). You can change your browser settings to refuse or restrict cookies, and you may delete them after they have been placed on your device at any time. If you do not accept or delete our cookies, some areas of our Sites that you access may take more time to work, or may not function properly.

---

7 *Insider, Inc.* is the owner of the *businessinsider.com* website.

Figure D.5.1

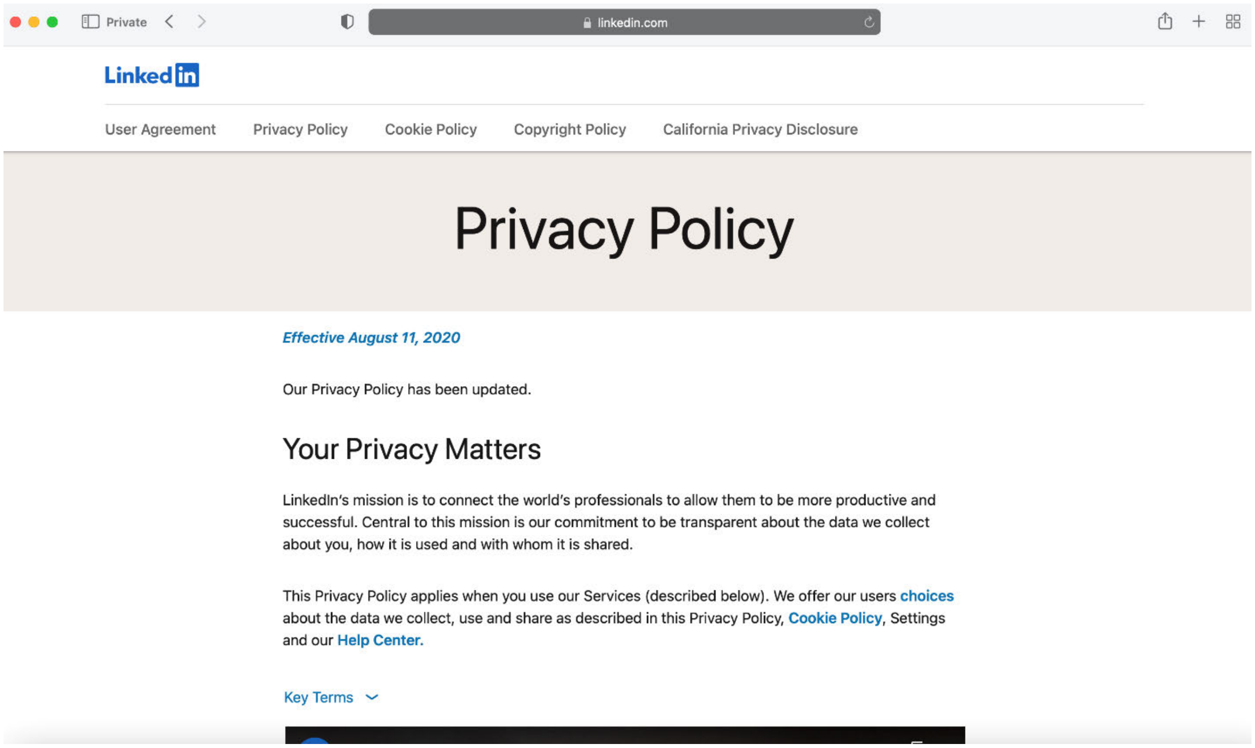
LinkedIn.com - Chrome



CONFIDENTIAL – SUBJECT TO PROTECTIVE ORDER

Figure D.5.2

LinkedIn.com - Safari


Private

linkedin.com

Linked in

User Agreement Privacy Policy Cookie Policy Copyright Policy California Privacy Disclosure

Privacy Policy

Effective August 11, 2020

Our Privacy Policy has been updated.

Your Privacy Matters

LinkedIn's mission is to connect the world's professionals to allow them to be more productive and successful. Central to this mission is our commitment to be transparent about the data we collect about you, how it is used and with whom it is shared.

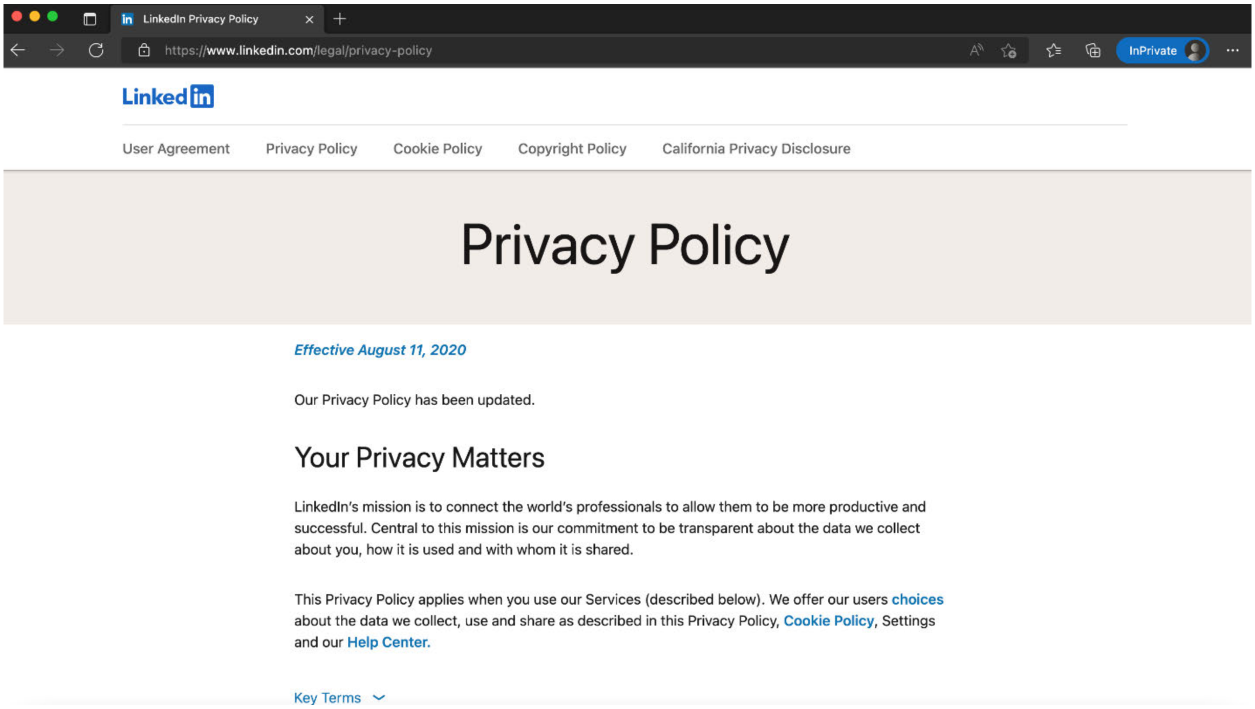
This Privacy Policy applies when you use our Services (described below). We offer our users **choices** about the data we collect, use and share as described in this Privacy Policy, **Cookie Policy**, Settings and our **Help Center.**

Key Terms

CONFIDENTIAL – SUBJECT TO PROTECTIVE ORDER

Figure D.5.3

LinkedIn.com - Edge



LinkedIn Privacy Policy

https://www.linkedin.com/legal/privacy-policy

InPrivate

Linked in

User Agreement Privacy Policy Cookie Policy Copyright Policy California Privacy Disclosure

Privacy Policy

Effective August 11, 2020

Our Privacy Policy has been updated.

Your Privacy Matters

LinkedIn's mission is to connect the world's professionals to allow them to be more productive and successful. Central to this mission is our commitment to be transparent about the data we collect about you, how it is used and with whom it is shared.

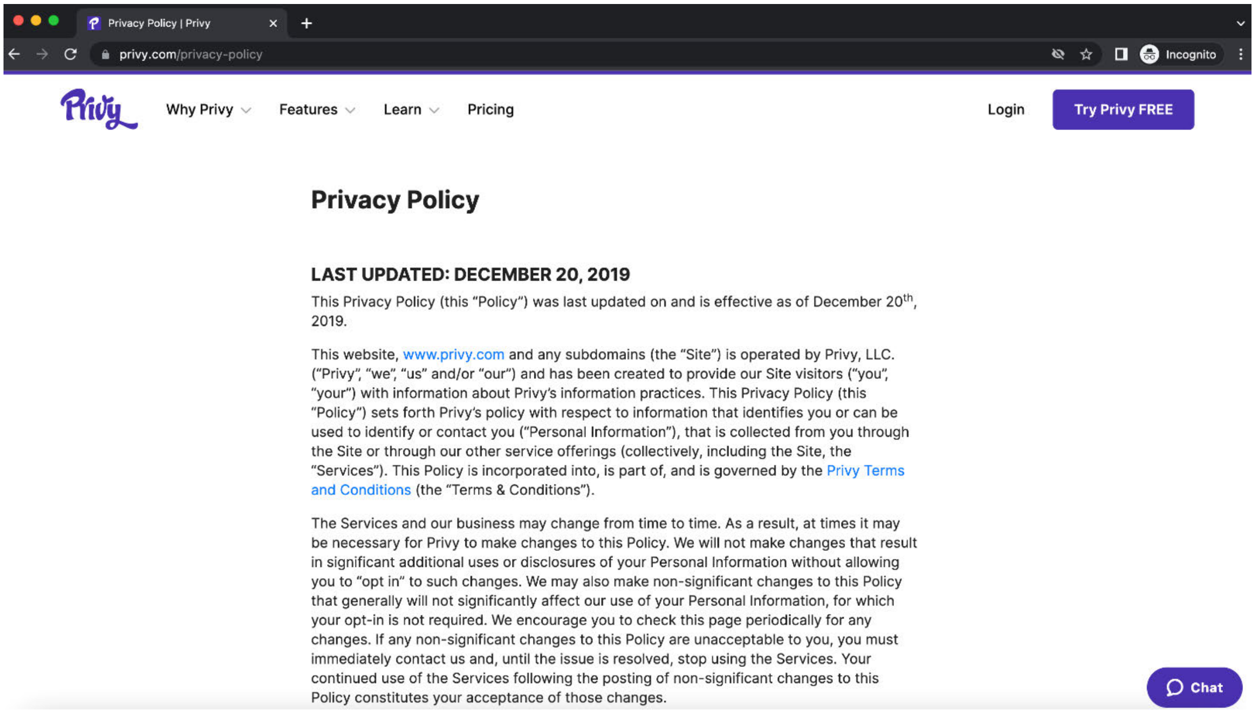
This Privacy Policy applies when you use our Services (described below). We offer our users choices about the data we collect, use and share as described in this Privacy Policy, Cookie Policy, Settings and our Help Center.

Key Terms

CONFIDENTIAL – SUBJECT TO PROTECTIVE ORDER

Figure D.6.1

Privy.com - Chrome



Privacy Policy

LAST UPDATED: DECEMBER 20, 2019

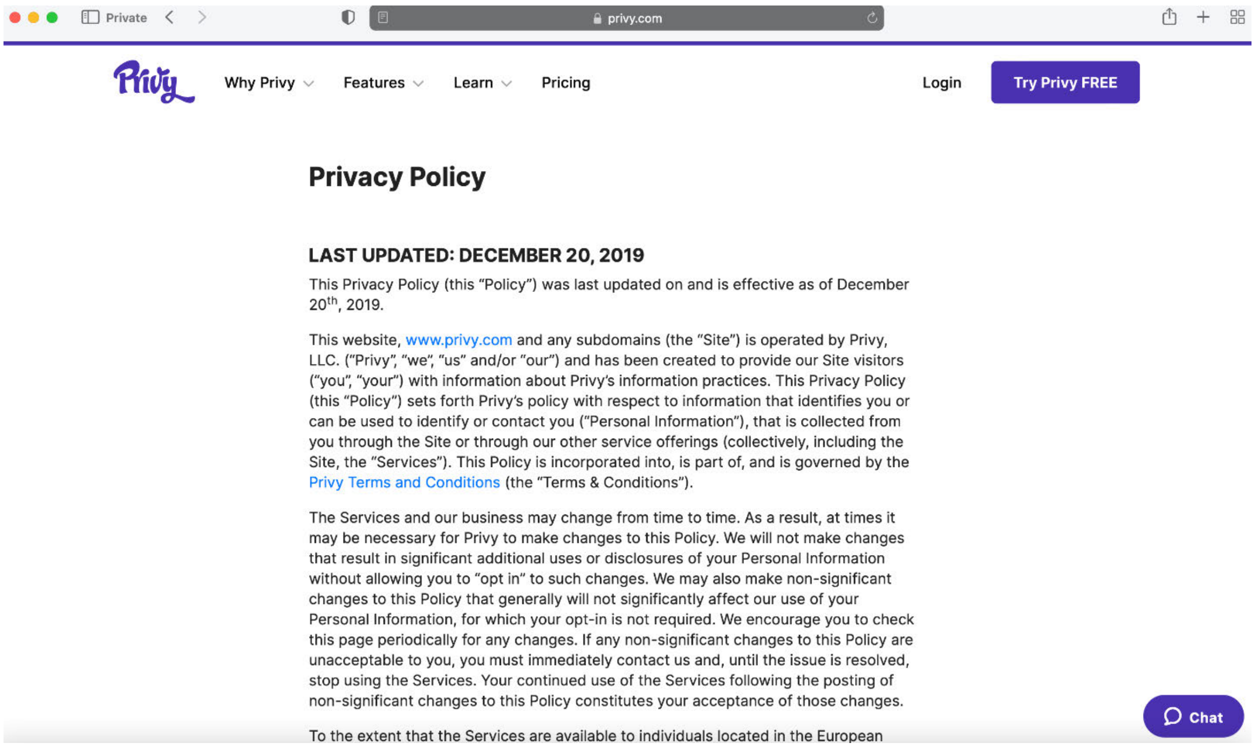
This Privacy Policy (this "Policy") was last updated on and is effective as of December 20th, 2019.

This website, www.privy.com and any subdomains (the "Site") is operated by Privy, LLC. ("Privy", "we", "us" and/or "our") and has been created to provide our Site visitors ("you", "your") with information about Privy's information practices. This Privacy Policy (this "Policy") sets forth Privy's policy with respect to information that identifies you or can be used to identify or contact you ("Personal Information"), that is collected from you through the Site or through our other service offerings (collectively, including the Site, the "Services"). This Policy is incorporated into, is part of, and is governed by the Privy Terms and Conditions (the "Terms & Conditions").

The Services and our business may change from time to time. As a result, at times it may be necessary for Privy to make changes to this Policy. We will not make changes that result in significant additional uses or disclosures of your Personal Information without allowing you to "opt in" to such changes. We may also make non-significant changes to this Policy that generally will not significantly affect our use of your Personal Information, for which your opt-in is not required. We encourage you to check this page periodically for any changes. If any non-significant changes to this Policy are unacceptable to you, you must immediately contact us and, until the issue is resolved, stop using the Services. Your continued use of the Services following the posting of non-significant changes to this Policy constitutes your acceptance of those changes.

Figure D.6.2

Privy.com - Safari



Privacy Policy

LAST UPDATED: DECEMBER 20, 2019

This Privacy Policy (this "Policy") was last updated on and is effective as of December 20th, 2019.

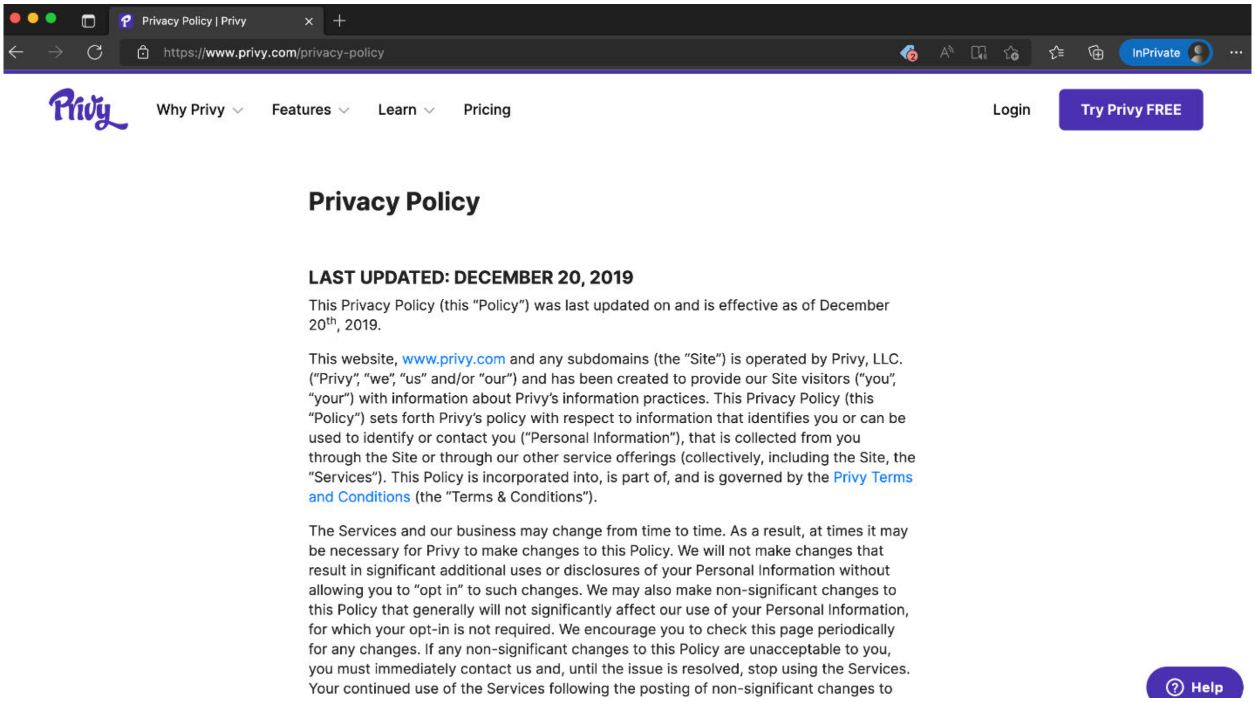
This website, www.privy.com and any subdomains (the "Site") is operated by Privy, LLC. ("Privy", "we", "us" and/or "our") and has been created to provide our Site visitors ("you", "your") with information about Privy's information practices. This Privacy Policy (this "Policy") sets forth Privy's policy with respect to information that identifies you or can be used to identify or contact you ("Personal Information"), that is collected from you through the Site or through our other service offerings (collectively, including the Site, the "Services"). This Policy is incorporated into, is part of, and is governed by the Privy Terms and Conditions (the "Terms & Conditions").

The Services and our business may change from time to time. As a result, at times it may be necessary for Privy to make changes to this Policy. We will not make changes that result in significant additional uses or disclosures of your Personal Information without allowing you to "opt in" to such changes. We may also make non-significant changes to this Policy that generally will not significantly affect our use of your Personal Information, for which your opt-in is not required. We encourage you to check this page periodically for any changes. If any non-significant changes to this Policy are unacceptable to you, you must immediately contact us and, until the issue is resolved, stop using the Services. Your continued use of the Services following the posting of non-significant changes to this Policy constitutes your acceptance of those changes.

To the extent that the Services are available to individuals located in the European

Figure D.6.3

Privy.com - Edge



Privacy Policy | Privy

https://www.privy.com/privacy-policy

InPrivate

Privy Why Privy Features Learn Pricing Login Try Privy FREE

Privacy Policy

LAST UPDATED: DECEMBER 20, 2019

This Privacy Policy (this "Policy") was last updated on and is effective as of December 20th, 2019.

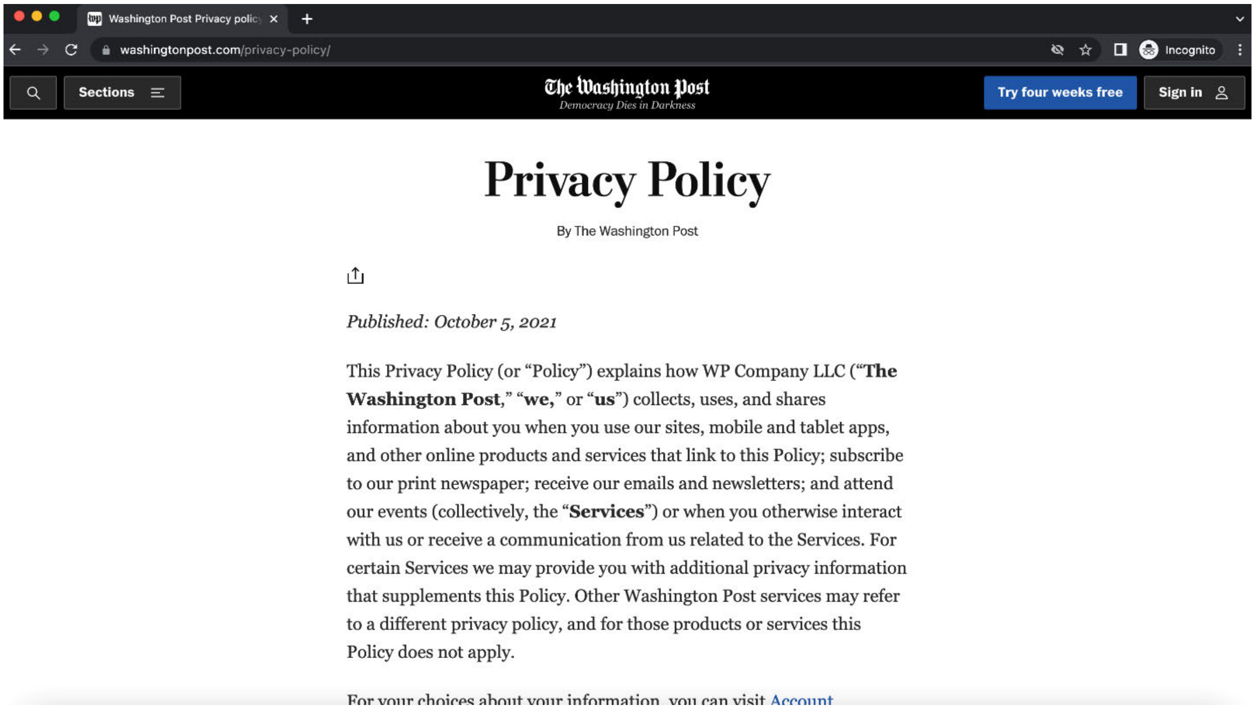
This website, www.privy.com and any subdomains (the "Site") is operated by Privy, LLC. ("Privy", "we", "us" and/or "our") and has been created to provide our Site visitors ("you", "your") with information about Privy's information practices. This Privacy Policy (this "Policy") sets forth Privy's policy with respect to information that identifies you or can be used to identify or contact you ("Personal Information"), that is collected from you through the Site or through our other service offerings (collectively, including the Site, the "Services"). This Policy is incorporated into, is part of, and is governed by the Privy Terms and Conditions (the "Terms & Conditions").

The Services and our business may change from time to time. As a result, at times it may be necessary for Privy to make changes to this Policy. We will not make changes that result in significant additional uses or disclosures of your Personal Information without allowing you to "opt in" to such changes. We may also make non-significant changes to this Policy that generally will not significantly affect our use of your Personal Information, for which your opt-in is not required. We encourage you to check this page periodically for any changes. If any non-significant changes to this Policy are unacceptable to you, you must immediately contact us and, until the issue is resolved, stop using the Services. Your continued use of the Services following the posting of non-significant changes to

Help

Figure D.7.1

WashingtonPost.com - Chrome



Privacy Policy

By The Washington Post

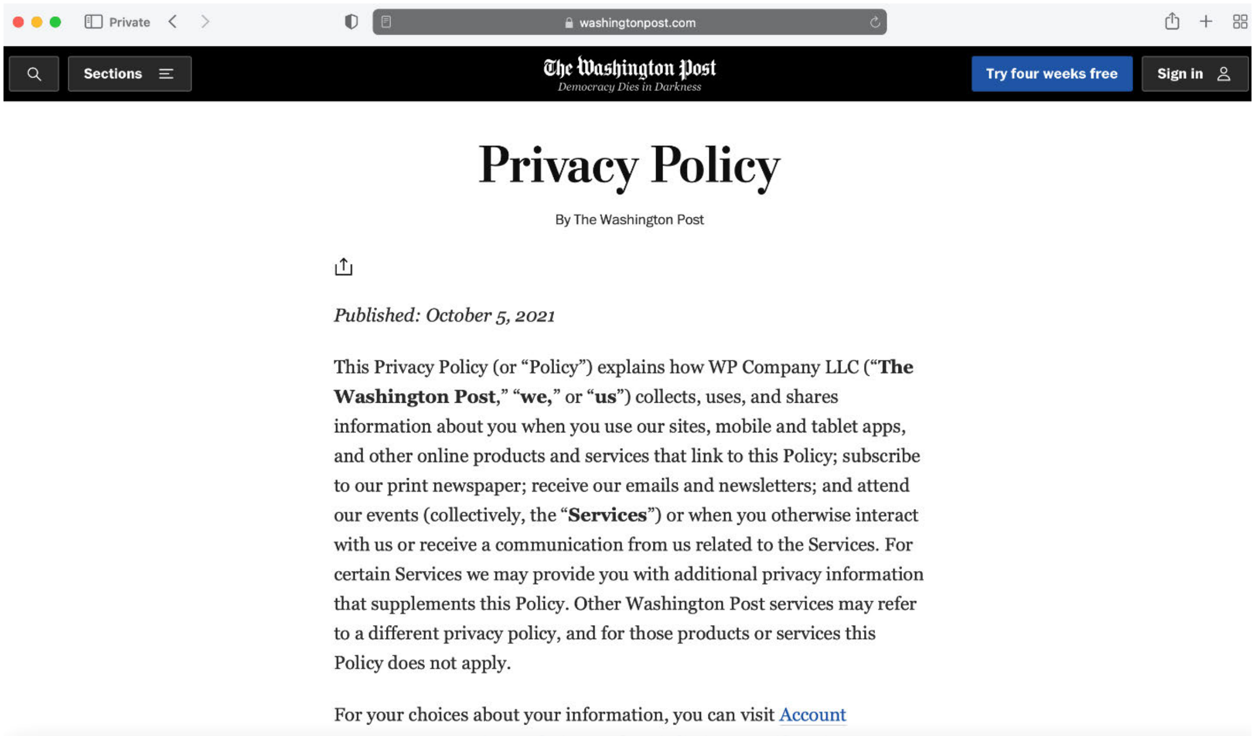
Published: October 5, 2021

This Privacy Policy (or "Policy") explains how WP Company LLC ("**The Washington Post**," "**we,**" or "**us**") collects, uses, and shares information about you when you use our sites, mobile and tablet apps, and other online products and services that link to this Policy; subscribe to our print newspaper; receive our emails and newsletters; and attend our events (collectively, the "**Services**") or when you otherwise interact with us or receive a communication from us related to the Services. For certain Services we may provide you with additional privacy information that supplements this Policy. Other Washington Post services may refer to a different privacy policy, and for those products or services this Policy does not apply.

For your choices about your information, you can visit Account

Figure D.7.2

WashingtonPost.com - Safari



Privacy Policy

By The Washington Post

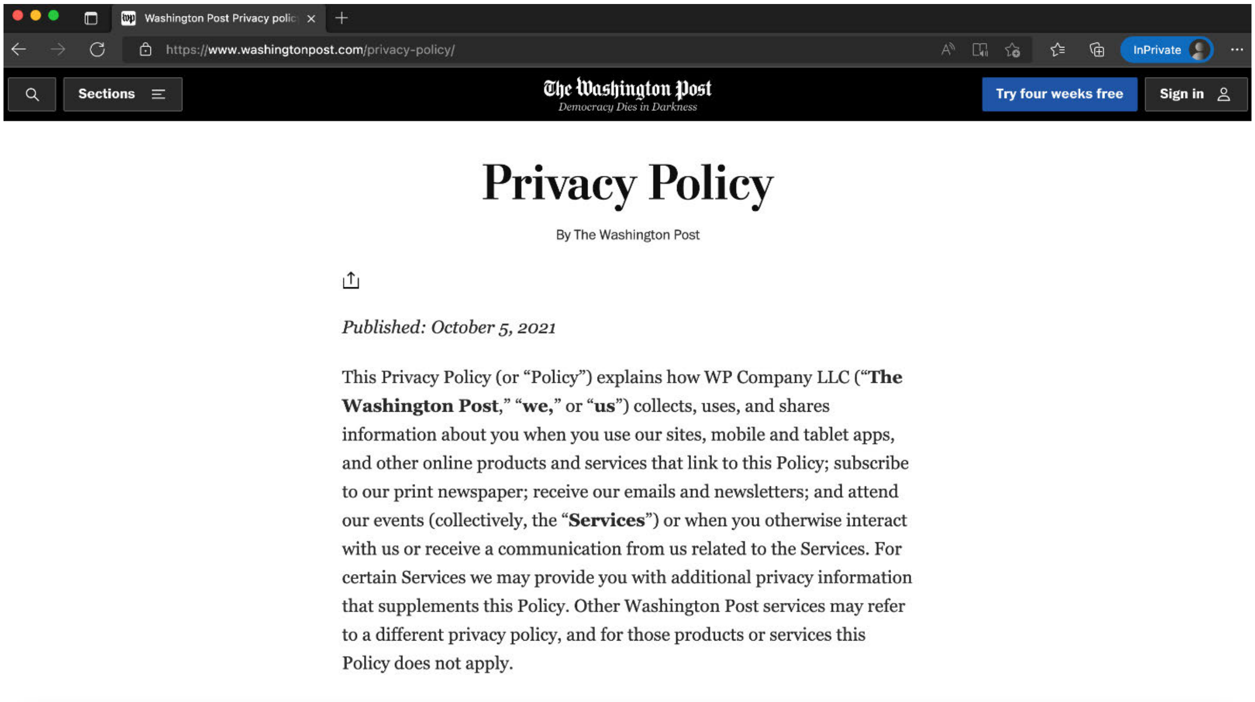
Published: October 5, 2021

This Privacy Policy (or "Policy") explains how WP Company LLC ("**The Washington Post**," "**we,**" or "**us**") collects, uses, and shares information about you when you use our sites, mobile and tablet apps, and other online products and services that link to this Policy; subscribe to our print newspaper; receive our emails and newsletters; and attend our events (collectively, the "**Services**") or when you otherwise interact with us or receive a communication from us related to the Services. For certain Services we may provide you with additional privacy information that supplements this Policy. Other Washington Post services may refer to a different privacy policy, and for those products or services this Policy does not apply.

For your choices about your information, you can visit Account

Figure D.7.3

WashingtonPost.com - Edge



Washington Post Privacy polic

https://www.washingtonpost.com/privacy-policy/

InPrivate

Sections

The Washington Post

Democracy Dies in Darkness

Try four weeks free

Sign in

Privacy Policy

By The Washington Post

Published: October 5, 2021

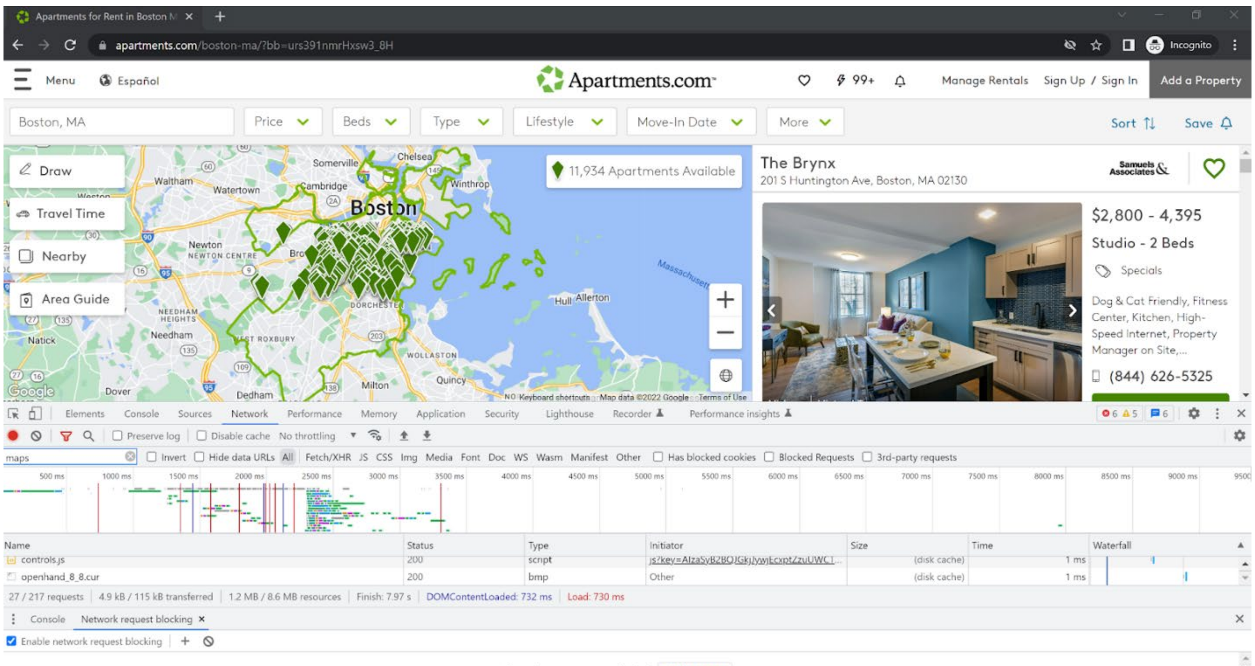
This Privacy Policy (or "Policy") explains how WP Company LLC ("**The Washington Post**," "**we,**" or "**us**") collects, uses, and shares information about you when you use our sites, mobile and tablet apps, and other online products and services that link to this Policy; subscribe to our print newspaper; receive our emails and newsletters; and attend our events (collectively, the "**Services**") or when you otherwise interact with us or receive a communication from us related to the Services. For certain Services we may provide you with additional privacy information that supplements this Policy. Other Washington Post services may refer to a different privacy policy, and for those products or services this Policy does not apply.

Appendix E

Illustration Of Website With And Without Third-Party APIs

Figure E.1

Apartments.com *With* Google Maps API



CONFIDENTIAL – SUBJECT TO PROTECTIVE ORDER

Figure E.2

Apartments.com *Blocking* Google Maps API